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GOULD AND PYLE'S CYCLOPEDIA
OF
PRACTICAL MEDICINE AND SURGERY

SCOTT

VOLUME II. KAKKÉ—ZOSTER

GOULD AND PYLE'S

CYCLOPEDIA OF PRACTICAL MEDICINE AND SURGERY

WITH PARTICULAR REFERENCE TO DIAGNOSIS AND TREATMENT

SECOND EDITION, REVISED AND ENLARGED

VOLUME II. KAKKÉ—ZOSTER

By R. J. E. SCOTT, M. A., B. C. L., M. D., New York

WITH SIX HUNDRED AND FIFTY-THREE ILLUSTRATIONS

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K

KAKKÉ.—See Beri-Beri.

KALA-AZAR. A chronic infectious disease widely distributed in certain parts of the tropics and characterized by persistent remittent fever, great splenic as well as hepatic enlargement, anemia, emaciation, and dysenteric symptoms. Hemorrhages into the skin and mucosa may be observed. Ulcers may appear on the skin or mucosa. The disease is probably caused by the Leishman-Donovan parasite, a form of trypanosome. The organism is obtained by splenic or hepatic puncture. This procedure should be resorted to for accurate diagnosis after the possibility of leukemia has been eliminated. The parasites are also found in ulcerations, bone marrow, and lymph glands near lesions and rarely in the peripheral blood. These bodies are round or oval, sharply outlined when stained, usually grouped in rosettes. Concurrent with this disease, malaria or hookworm disease may be found. The disease is fatal, death ensuing sooner or later from exhaustion or intercurrent disease. Isolation and quarantine should be insisted upon.

KATATONIA (Alternating Insanity).—A mental disease characterized by irregular cyclic symptoms, ranging from melancholia to mania, followed by stupidity and confusion, with cataleptoid phenomena, and by lucidity for a time, recovery, or passing to a dementia. There may be a hereditary predisposition. The exciting causes are usually the result of some excess. It is rarely associated with organic brain-disease. No characteristic lesions have been found associated with katatonia.

A typical case begins with melancholia, the mental depression, uneasiness, and distress followed after a variable period by mania, associated with hallucinations and delusions. This period is followed in turn by a condition of attonita, or rigidity and immobility, or a cataleptoid paroxysm. Any of the stages may be succeeded by confusional symptoms, or a true dementia may develop. During the maniacal stage there is a tendency in many cases to histrionic and sermon-like declamation, or the speech may be of the verbigeration character—that noisy, incoherent, and meaningless speech seen in many manias, composed largely of the constant repetition of a few words or phrases. During the stage of attonita the presence of the so-called mutism, or mutacismus, "a pathologic tendency to be silent," may continue for days, weeks, or months, or it may be interrupted by periods of verbigeration. The immobility or rigidity so characteristic of a period of katatonia is frequently alternated with automatic, incessant, and monotonous movements—the stereotyped movements. Patients suffering from katatonia often refuse food for days at a time, and then suddenly present symptoms of bulimia. Vasomotor and trophic changes are frequent, one of the most constant being cyanosis of the hands and other peripheral parts. Hematoma of the ear, insane ear, or perichondritis of the auricle, is frequent. Epileptiform attacks may usher in the disease or occur during any of its stages. Katatonia differs from circular insanity in the absence of a genuine lucid interval, and the presence of the stage of attonita and catalepsy. The disease may continue for a number of years and recovery follow, but, as a rule, the prognosis is unfavorable.

Treatment consists in attention to the general condition, and combating the various symptoms as they arise. In cases associated with anemia, arsenic and strychnin seem to be valuable. Two cases were rapidly improved with small doses of hyoscin hydrobromid, 1/300 to 1/200 of a grain, morning and evening.

KÉFIR.—A fermented drink prepared from the milk of a cow or mare by the addition of a mushroom-like ferment found in the Caucasian Mountains. It is used by the natives of the Asiatic plains as a remedy for struma, anemia, lung and stomach diseases. Kéfir is richer in albuminoids than Kumyss, is less alcoholic and less acid.

The following table shows the average composition of Milk, Kumyss and Kéfir:—

	Cow's milk.	Kumyss.	Kéfir.
Albuminoids (casein, etc.)....	4	1	4
Butter,....................	4	2	2
Sugar of milk,..............	5	2½	2
Lactic Acid,................	—	1	1
Alcohol,...................	—	1½	1
Water and salt.............	87	92	90

KELENE.—See Ethyl Chlorid.

KELOID (Cheloid).—A tumor of the skin resulting from overgrowth of connective tissue within the corium, arising from preexisting scar tissue or inflammatory exudation. The scars from lupus, burns, and syphilis are especially prone to it, and it may arise from the scars of boils. Colored races are more affected than the white, brunets more than blonds. It is most common in the middle-aged. It is more frequent over the sternum and about the shoulders and neck.

Keloid seldom gives rise to much inconvenience, and when left to itself, progresses slowly or remains stationary for life or years, and may disappear spontaneously. It has no tendency to desquamation or ulceration.

Keloid formed in scar tissue should never be removed by the knife or caustics, since it always returns quickly. Left to itself, it has a tendency to undergo slow atrophic changes. Mercurial or lead plaster will sometimes check a keloid growth. Belladonna plaster is useful in alleviating pain, and occasionally recourse must be had to morphin. Linear scarification and electrolytic puncture have been advised.

KERATITIS.—See CORNEA (Diseases).

KERATOGLOBUS.—Distention and protrusion of the cornea. The sclerotic may also become distended in severe cases. When so extensive as to prevent closure of the lids, it has been called **buphthalmos.** When the distention is transparent, regular, and cone-shaped, the apex of the cone being the center of the cornea, it is called **keratoconus,** or **conic cornea.** When the protrusion is opaque or connected with synechia of the iris, it is called **staphyloma** of the cornea, or anterior staphyloma. When due to increase in the fluids of the eye, with increased tension and uniform ectasia, it is called **hydrophthalmos.** Enlargement of the cornea is also called **megalocornea.**

KERATOSIS PILARIS.—A cutaneous affection characterized by pin-head sized papules situated at the mouths of the follicles, and resulting from epidermal accumulations or hypertrophy. The lesions are grayish, whitish, or blackish in color and are found most frequently on the extensor surfaces of the extremities. The skin is dry and rough, but there is no itching. Infrequent bathing is believed to be the most common cause. Bathing with soft soap and alkaline water, followed by vigorous friction, and inunctions of petrolatum constitute the treatment.

KERNIG'S SIGN.—See CEREBROSPINAL MENINGITIS.

KIDNEY, CONGESTION. **Varieties.**—(1) Acute congestion; (2) chronic congestion.

Acute Congestion of the Kidney.

Synonyms.—Active hyperemia; active congestion.

Etiology.—(1) Irritant poisons; (2) surgical operations; (3) exposure to the cold and wet; (4) pregnancy; (5) eruptive fevers.

Pathology.—The kidney is slightly enlarged in size from an excessive amount of blood, and of a dark red color. The renal epithelium shows evidence of parenchymatous degeneration.

Symptoms and Clinical Course.—There is dull pain over the lumbar region, and pressure over the abdominal wall in the region of the kidney may occasion pain. The urine is diminished in amount, sometimes suppressed, darker in color, of high specific gravity, containing albumin, often blood and epithelial casts.

Prognosis depends upon the cause. In most cases it is favorable.

Treatment demands rest in bed and a liquid diet. The bowels should be kept active with Rochelle or Epsom salts (4 drams). Water may be given in abundance to aid in eliminating the effete products in the kidney.

Hot baths or vapor baths, by opening the pores of the skin, aid the affected renal organs in this work. The baths should not be prolonged over 10 minutes.

The following may be given:

℞.	Sweet spirit of niter,	ʒ vj
	Solution of potassium citrate,	℥ ijss
	Simple elixir,	ʒ iij
	Water, enough to make	℥ iv.

Or—

℞.	Citrated caffein,	ʒ ss
	Water,	℥ ij.

Two teaspoonfuls every 3 or 4 hours.

Chronic Congestion of the Kidney.

Synonyms.—Passive hyperemia; enlargement of kidney; passive congestion.

Etiology.—It is often the result of (1) venous stasis, as from disease of the heart, lungs, or liver; (2) of pressure of tumor on the renal veins or in the region of the kidney.

Pathology.—The kidney is swollen and of a dark brown or purple color. Hemorrhages occur in the cortex and beneath the capsule, and often in Bowman's capsules. The tubules may be distended with blood. In cases of long standing the kidney may become fatty, necrotic, or there may be an overgrowth of the connective tissue, and the affected organ will become smaller in size and very hard. This change is called *cyanotic induration.* Many of the epithelial cells of the tubules are fatty and contain oil droplets.

Symptoms and Clinical Course.—There is dull pain or feeling of weight over the loins. The urine is dark in color, scanty, and of high specific gravity (over 1020). Uric acid is increased; urea is normal or slightly increased. In the early stages albumin may be detected at certain intervals; later, it is found constantly. Hyaline casts and red blood-corpuscles are often present. There may be edema and anasarca.

The condition may terminate in true nephritis.

Diagnosis.—

CHRONIC CONGESTION OF THE KIDNEY.	NEPHRITIS.
1. Congestion in other organs.	1. Kidney often first affected.
2. Urine high specific gravity.	2. Urine high specific gravity at first, then gradually falling.
3. Transient albuminuria.	3. Albumin nearly always present.
4. Hyaline casts.	4. All varieties of casts, especially granular casts.
5. Urates and uric acid increased.	5. Diminished.

The prognosis and **treatment** are the same as in acute congestion of the kidney. See NEPHRITIS.

KIDNEY, EXAMINATION. **Normal Position of the Kidneys.**—The kidneys are situated in the right and left lumbar regions respectively. The right is somewhat lower than the left, on account of being pushed downward by the liver. The left is immediately adjoining the spleen.

The kidneys extend from the upper border of the twelfth dorsal vertebra to the third lumbar vertebra. Posteriorly, they rest upon the lower portion of the diaphragm and the fascia covering the quadratus lumborum and the psoas magnus muscles. Anteriorly, the right is covered by the right lobe of the liver, the descending portion of the duodenum, and the ascending colon; the left one has in front the fundus of the stomach, the tail of the pancreas, and the descending colon. Both kidneys descend about 1/2 of an inch during inspiration.

Physical Examination. Palpation.—The abdominal walls should be relaxed by drawing up the knees when the patient is in the dorsal position. Bimanual examination is the best. One hand should be placed, posteriorly, over the region of the kidney, while the other, anteriorly, makes firm pressure downward upon the organ, and by a rotatory pressing movement the correct outline is determined.

At times it may be necessary to have the patient turn from one side to the other, or even upon the abdomen, in making the examination.

Percussion.—In persons with very thin abdominal walls percussion may be made anteriorly. Usually, however, this method of diagnosis must be applied posteriorly, by having the patient lie face downward and placing a cushion across the abdominal region. The cushion should be of sufficient height to press the kidneys agaist the muscles of the back. Strong percussion should be made, beginning from below upward, to find the lower border of the kidney. To find the external border, begin at a point farthest away from the organ, gradually moving toward it. It is practically impossible to detect the upper margin of each kidney, owing to the close relation to liver on the right and to spleen on the left. See KIDNEY (Surgery).

KIDNEY, INFLAMMATION.—See NEPHRITIS, PYELITIS.

KIDNEY, INJURIES.—The kidney may be wounded, either through the loin or the abdomen; in the latter case the peritoneal cavity is opened, and probably other organs injured as well. In one or two cases prolapse has occurred, the whole organ being squeezed out through a wound in the loins.

The symptoms are the same as in contusion of the kidney, with, in addition, those due to the wound.

The prognosis depends upon the nature of the injury; incised wounds heal readily; gunshot injuries, on the other hand, are very likely to be followed by suppuration and sloughing; but extensive urinary infiltration is not common. The lumbar plexus may be torn, the colon opened, and even the peritoneal cavity traversed by a bullet, without the result being fatal. Fistula, however, and serious bladder troubles, phosphatic calculus and cystitis, not infrequently make their appearance afterward.

Treatment.—Hemorrhage should be checked as soon as possible, and any foreign bodies that can be found removed at once; but prolonged exploration with a probe in order to find a bullet is not advisable. The wound should be left open; and, as there is always a tendency for it to become valvular, a large tube should be introduced down to the bottom. Later on, if suppuration occurs, free incisions are necessary. In prolapse of the kidney, if it is much injured, a ligature should be placed around the pedicle and the organ removed; in other cases an attempt may be made to return it. See KIDNEY (Surgery).

KIDNEY IN PREGNANCY.—See NEPHRITIS OF PREGNANCY, ECLAMPSIA.

KIDNEY, MOVABLE. Synonyms.—Floating kidney; wandering kidney ; ectopia renis; nephroptosis.

Definition.—A condition of the kidney, either congenital or acquired, in which the tissues around the organ are so lax and the renal vessels so elongated as to permit the kidney to be moved in certain directions, causing a movable tumor in the abdomen.

Etiology.—The kidney is normally held in position by the layer of peritoneum attached to the anterior surface of its adipose capsule. In movable kidney the adipose tissue in which the normal kidney is embedded partly or wholly disappears. The renal vessels are in many cases abnormally long. Relaxation of the abdominal walls from pregnancy or other causes; the use of tight corsets or girdles about the waist; violence; increased weight of the organ from disease; the pressure of tumors growing in the neighborhood of the kidney; and the traction of hernias, are all causes. The condition may be congenital or acquired; more frequently the latter. It is far more frequent in women than in men.

Recent anatomic studies have shown that the perirenal fascia contributes materially to the fixation of the kidneys. This fascia is a specialized portion of the retroperitoneal connective tissue, which descending from the lower part of the diaphragm, splits into two layers above the superior pole of the kidney, one passing in front and the other behind. The anterior layers blend with one another over the lumbar vertebræ. The posterior layer on each becomes attached to the vertebræ along the inner border of the psoas magnus muscle. Excessive development or acquired relaxation of this fascia, is now considered by many to be the sole cause of movable kidney.

Symptoms.—Floating kidney may and often does exist without any noticeable symptoms, the condition being unknown until accidentally discovered by the physician while making a physical examination of the abdomen. As a rule, however, patients experience a heavy, dragging pain in the abdomen, aggravated when walking or standing. There are also present gastrointestinal symptoms, more or less constant, with melancholia, aggravated by the mental anxiety over the presence of a tumor in the abdomen.

At times, from some unknown or unrecognized cause, the movable kidney swells and becomes very sensitive to the touch, and migrates a considerable distance from its normal position. Such an occurrence aggravates all the symptoms mentioned. This condition has been ascribed to a twisting of the ureter and consequent retention of the urine in the pelvis of the kidney, or to localized peritonitis, or to a partial strangulation of the kidney from compression or twisting of its blood-vessels. Hysteric symptoms are frequently observed in women suffering from wandering kidney.

Diagnosis.—The possibility of dislocation of the kidney is to be borne in mind in determining the nature of obscure tumors within the abdomen. Flint based the recognition of this variety of abdominal tumor on the following diagnostic points: "It is situated in the hypochondriac region. It has the size and shape of the normal kidney, and this may be determinable by palpation, which is most advantageously employed by placing one hand over the lumbar region and the other in front on the abdominal walls, and then making counter-pressure from one hand to the other. It is generally movable, and in some cases the organ can be restored to its proper situation." Other tumors are to be excluded by the absence of their diagnostic characters.

It is a rare occurrence to have a fatal termination from movable kidney *per se*.

Treatment is symptomatic. Some of the inconvenience, and sometimes the suffering, attending movable kidney may be lessened by means of an abdominal bandage, belt, or supporter. Stengel proposes two plans of treatment: (1) Overfeeding, to restore the necessary perirenal fat—which, however, was not successful; (2) artificial support by an abdominal belt and kidney-shaped pad so constructed as to exert pressure upward, backward, and to the right, instead of directly upward, as is usual. If attacks of pain and swelling occur, the patient should be placed in bed, have hot applications over the abdomen, opiates ordered, and attempts made to replace the organ. Extirpation of a movable kidney has been successfully performed a number of times. Nephrorrhaphy is an operation for fixation of the kidney to the parietes by means of sutures. See KIDNEY (Surgery).

KIDNEY, PAIN.—There is great disposition among the laity to attribute any pain in the loins to kidney-disease. Very often **lumbar neuralgia, lumbago,** or **muscular rheumatism** is the source of the trouble. **Chronic nephritis** is not generally associated with localized pain. **Acute nephritis** may be accompanied by severe pain in the region of the kidney. **Chronic renal congestion** is accompanied by dull pain and a feeling of weight over the loin. **Movable kidney** may produce similar symptoms.

Renal colic, due to the passage of a calculus from the pelvis of the kidney through the ureter, is the most common cause of pains in the kidney. The history of previous attacks of a similar character, the radiation of the pain downward into the groin and testicle, or to the end of the penis, aid in deciding the diagnosis; while the presence of blood in the urine, the irritable bladder, and the intense agony in the paroxysm, in contrast to the remissions, and the sudden onset, still further point to this condition. These symptoms are not, however, always present in sufficient degree or in association to make the diagnosis easy, and the absence of one prominent sign may seriously impair its certainty. **Somewhat similar pains** arise from pyelitis with possible nephritic abscess, from neuralgia of the kidney or the tissues near by, from nerve pains due to spinal caries or irritation, and, more rarely, from tumors adjacent to or in the gland, or from aneurysm of vessels: as, for example, aneurysm of one of the branches of the mesenteric artery. A calculus embedded in the kidney may be found, or excessive deposits of oxalic acid or other crystals, manifesting themselves in gouty kidney, or, finally, aortic valvular disease. Chronic pain in the kidney is ascribed to slight injury, and is said to be commonly met with in young women who endeavor while wearing corsets to take violent physical exercise.

The presence of **pyelitis** rarely produces great pain, and the appearances of the urine point clearly to the cause of the discomfort, though if the attacks are sudden in onset, the cause may be calculus in the pelvis of the kidney, surrounded by septic changes. The failure of health and the possible febrile movements and chills still further point to pyelitis. So, too, nephritic abscess is accompanied by so much systemic disturbance in many cases as to make the diagnosis clear.

The presence of spinal tenderness on pressure or motion in the dorsal or lumbar regions, and the history of **spinal irritation** or **disease,** decides this as the cause of the pain. The discovery of **aneurysm** of any of the abdominal vessels may be impossible, unless it is large enough to manifest itself through the viscera or abdominal wall on palpation.

The diagnosis of **stone embedded in the kidney** is very difficult and uncertain, but the onset of an attack of renal pain arising from oxaluria or an attack of gout is usually bilateral, and is associated with a scanty urine of high specific gravity, and with much lumbar soreness. A gouty history or that of having eaten large amounts of oxalic-acid bearing foods, such as pears, tomatoes, and cabbage, may be recognized as the predisposing causes of attack.

Fenwick asserts that there are two great groups of renal stones, and that in each class characteristic pain may be felt. In the cortical stones the pain is fixed and continuous, and is liable to exacerbation on movement, but does not depend so much upon changes in the diet. On the other hand, pelvic stones cause obstruction and colic, the pain radiating down into the groin and testicle, while the urine becomes bloody, purulent, or scanty. Fenwick also believes that the posture of the patient in bed is typical. In 9 out of 12 cases his patients could sleep only on the affected side. Cortical stones, in his opinion, never cease to give discomfort, but pelvic stones may become embedded, and the patient go for long periods of time free from any discomfort.

Many years ago attention was called to the fact that **aortic valvular disease** often caused pain to be radiated into the hypochondrium. Ralfe thinks that aching kidney is often due to **unrecognized trauma.** He has known of cases of young women who, by wearing tight corsets while playing tennis or other violent games, have so bruised the right kidney by some sudden and violent movement as to suffer seriously for days afterward. Again, Ralfe asserts that sharp renal pain sometimes arises in cases of obstinate **constipation,** in which are accumulated in the colon hard scybalous masses which, by their pressure, produce reflex irritation and pain.

KIDNEY, STONE (Nephrolithiasis; Renal Calculus).—A condition in which concretions or calculi form in the kidney structure, pelvis of kidney, or ureter.

Etiology.—(1) Early infancy; (2) gout; (3) old age; (4) lithemia.

Pathology.—Renal calculi may be composed principally of uric acid, oxalate of lime, or phosphates of calcium, magnesium, and potassium.

They may be of different sizes and shapes, some having pointed edges, giving rise to excruciating pain as they pass into the ureter. If the stone forms in the pelvis of the kidney or the ureter, some foreign body, such as a blood-clot, generally acts as a nucleus.

Phosphatic stones are whitish or grayish-white, and soft in consistence. They are the largest variety. The uric acid stones are dark red or reddish-brown in color, very hard, and often pyramidal in shape.

Symptoms and Clinical Course.—In some cases no symptoms arise. The most common symptom is pain in the region of the kidney, aggravated by exercise or sudden jarring of the body. If the ureter is totally occluded, hydronephrosis occurs. When the calculus passes into the ureter, true renal colic ensues.

This begins with a distinct chill, blueness of the extremities, and agonizing pains in the lumbar region, radiating toward the umbilicus, down the ureters, and into the testicles, which may become retracted. Nausea and vomiting come on, accompanied by increased micturition, a feeble pulse, and symptoms of collapse. Occasionally after the paroxysm has ended, blood may be detected in the urine, and in some cases the stone is passed by the urethra.

Diagnosis.—(See also Colic.)

Renal Colic.	Intestinal Colic.	Biliary Colic.
1. Sudden onset....	1. Premonitory symptoms, such as nausea, borborygmi.	1. Sudden onset.
2. Chill, subnormal temperature, collapse.	2. No chill.......	2. Chill and collapse, followed by jaundice.
3. Pain begins in region of affected kidney, radiating down thigh and testicle, which may retract.	3. Pain begins in abdominal region, radiating toward umbilicus.	3. Pain begins in region of stomach on right side, radiating toward umbilicus.
4. Micturition frequent.	4. Micturition normal.	4. Micturition normal; urine contains bile.
5. Blood in urine...	5. No blood in urine.	5. No blood in urine.
6. Presence of stone in urine.	6. No stone in urine.	6. Stone often passed in feces; stools devoid of bile.
7. Pain continues for a day or two in affected ureter.	7. Pain uniform over abdomen.	7. Pain uniform over abdomen.

Prognosis is guardedly favorable.

Treatment.—For the acute attack of renal colic morphin (1/4 of a grain) and atropin (1/125 of a grain) should be given at once, and repeated in 2 hours, if necessary, to relieve the extreme agony of the patient. Hot flannel cloths, stupes, or poultices should then be placed over the affected area, and may aid in rendering the patient comfortable.

In the constantly recurring attacks, in which the symptoms are not so violent, much may be done by means of dieting. Meats, tea, and coffee should be greatly restricted; alcohol and tobacco should be avoided. Milk, soups, fruits, vegetables, eggs, and an easily assimilable diet is best.

Bathing in lukewarm water 2 or 3 times a week, followed by massage, will stimulate the skin and keep the circulation active.

The bowels should never be allowed to become constipated, and saline purgatives, such as Rochelle salts (4 drams), Epsom salts (4 drams), and Carlsbad salts (1 to 2 drams), may be given.

Alkaline diuretics may be valuable.

℞.	Potassium acetate,	each,	ʒ ij
	Potassium bicarbonate,		
	Potassium citrate,		
	Fluidextract of triticum,		ʒ iv
	Water, enough to make,		℥ iv.

One teaspoonful every 3 or 4 hours.

Failing to secure relief by medicinal measures, surgical interference should be effected and the stone removed. See Kidney (Surgery).

KIDNEY, SURGERY.—Although the kidney had occasionally been the subject of surgical operation in early times, premeditated kidney surgery may be said to have begun with Gustav Simon's successful extirpation of the one kidney for ureterouterine abdominal fistula in 1869. He did this operation after a demonstration of the healthy condition of the other kidney, and after a series of experiments on dogs showing that the removal of one kidney was a practicable procedure. Two years later Simon removed another kidney for calculi and suppurative pyelitis. The patient unfortunately died of pyemia on the twenty-first day after the operation. At that time surgeons were unacquainted with antiseptic methods. Since the publication of Simon's work on the surgery of the kidney, in 1871 ("Chirurgie der Nieren" Erlangen), the methods of diagnosis have been so much improved in scope and precision by the ureter cystoscope, by the X-ray photographs, and by the study of clinical and pathologic material that the radical operations of 20 years ago have given way to partial nephrectomies, nephrotomies, and various reparative operations on the ureter and pelvis of the kidney.

Location.—The kidneys are located in the back in such a position that a little more than one-half of each is exposed below the last rib. The hilus or root of the kidney, into which pass the renal arteries and out of which pass the renal veins and the ureters, is directed toward the vertebræ and a little downward, so that a line passing longitudinally through the middle of one kidney from pole to pole would meet a similar line, passing in the same way through the opposite kidney, somewhere in the region of the body of the sixth dorsal vertebra.

The ureters are small tubes, 30 cm. long, the walls composed of 2 layers of muscle and a thick layer of mucous membrane. They are supplied with blood-vessels from the kidney and bladder and from the adjoining connective tissue. The ureters are not of uniform caliber throughout their length, but are funnel-shaped at the kidney, and meet with a constriction as they pass over the brim of the pelvis, and another upon entering the bladder. The pelvis of the kidney is continuous with the ureter, and is connected with the several calices by infundibula. The relation of these parts is not uniform.

The kidney may be approached through an incision 4 to 6 inches long along the outer border of the quadratus lumborum muscle, or it may be reached through a laparotomy wound. The lower 3 cm. of the ureter may be approached in women by way of the vagina, and the rest of the ureter can be easily examined, both in men and women, through a laparotomy wound.

Operations.—Aspiration of the kidney may be performed either for the purpose of diagnosing a renal swelling, or for the relief of such affections as hydronephrosis, pyonephrosis, or hydatid or blood cysts. It should be done with the ordinary precautions, any prominent or fluctuating spot being chosen for the puncture.

Nephrotomy consists in making an incision into the kidney for the purpose of evacuating and draining the fluid or pus in the case of hydronephrosis, pyonephrosis, hydatid cyst, abscess, etc. The tumor may be exposed by the lumbar or lateral incision, as described in nephrectomy. An incision is made into the kidney, the fluid allowed to run out, the wound thoroughly irrigated with some antiseptic solution and insufflated with iodoform, a large-sized drainage-tube inserted into it, and voluminous dressings of absorbent cotton and the like applied to receive the subsequent discharges.

Nephrolithotomy consists in cutting into a kidney for the purpose of extracting a calculus. The kidney may be exposed either by the lumbar or lateral incision, as described in nephrectomy. If a stone is felt, an incision should be carefully made over it, the finger or forceps introduced, and the stone extracted. If one cannot be felt, a needle should be thrust into the kidney at several situations, and, this failing, an incision should be made into it, and the finger and a probe introduced to search for stone. A drainage-tube should be placed in the wound, and an antiseptic and absorbent dressing applied. The urine will at first escape through the wound, but will cease to do so, as a rule, after a longer or shorter interval.

Nephrectomy, or removal of the kidney, may be done without opening the peritoneum, either by a lumbar or lateral incision, or through the peritoneal cavity, the incision being then made either in the linea alba or linea semilunaris.

The Extraperitoneal Operation.—If the incision is made in the lumbar region, it may be vertical, T-shaped, or oblique, like that of colotomy. If the lateral incision is chosen, it should be made obliquely from near the tip of the last rib toward the anterior superior spine of the ilium. Its advantages are that it combines the facilities of the intraperitoneal and the greater safety of the lumbar incision, as it does not involve opening the peritoneal cavity. The kidney having been exposed by any of these incisions, the capsule should be opened, the finger introduced, and the kidney enucleated from its capsule; the renal artery and vein should then be securely tied with a silk ligature passed round them by an aneurysm needle, and the ureter separated in a similar way. The kidney is removed by cutting through the pedicle with scissors, and the wound drained and dressed antiseptically.

The Intraperitoneal Operation.—This consists in opening the peritoneal cavity by one of the incisions mentioned above, drawing the intestines aside, and then exposing the kidney by cutting through the peritoneum in front of it, external to the colon. The vessels are then tied separately, the kidney removed, and the peritoneum united, the same precautions being adopted as after an ovariotomy. A drainage-tube is passed by some surgeons through a counter opening in the loin, and the end of the ureter brought out of the wound.

The dangers of nephrectomy are: (1) Severe shock; (2) excessive hemorrhage; (3) suppression of urine from disease or absence of the opposite kidney; (4) peritonitis from wounding the peritoneum; (5) laceration of the colon; (6) inclusion of the vena cava in the ligature of the pedicle and injury of the duodenum in operating on the right side.

Nephrorrhaphy is an operation for fixing a floating or movable kidney by exposing the kidney in the loin and attaching it with sutures to the parietes. It should only be done when there is intense pain and constant suffering which palliatives have failed to relieve.

Surgery of the kidney may be necessary for (1) Congenital malformation, (2) for injury of the kidney, (3) for disease of the kidney, or (4) for deformity of the kidney or ureter, the result of injury or disease.

When a kidney is found abnormally placed in the pelvis of a woman likely to bear children, it must be removed to make parturition possible. When a congenitally cystic kidney grows after birth so as to interfere with the development of the child, it must be removed. When a ureter congenitally misplaced discharges urine into the vagina or urethra, the ureter must be implanted into its proper place, or the kidney tributary to it must be removed. When there is a congenital deformity of the ureter or kidney which results in complete or partial hydronephrosis, the deformity must be corrected or the whole kidney or part of it must be removed.

There are two sorts of **injury of the kidney** requiring surgical treatment. The kidney is sometimes driven out of place by a blow, a fall, or a slow compression, as between two freight cars. A suddenly displaced kidney without rupture has given rise to: (1) No symptom except pain; (2) to pain and obstruction of the ureter by torsion or kinking, and the rise of temperature attendant; and (3) to pain, tumor, and bloody urine, or these symptoms with a perirenal or abdominal hematoma.

The kidney is sometimes ruptured by the direct action of a blow, a fall, or a broken twelfth rib. The result is a hemorrhage either outward into the perirenal tissues or inward into the pelvis of the kidney or one of the calices; in the latter case there is bloody urine. Sometimes the rupture extends entirely through the cortex, and both blood and urine are then found in the perirenal tissue. In children the perirenal peritoneum is often ruptured by the same insult that ruptures the kidney. Then the blood and urine are extravasated into the general peritoneal cavity. The perirenal hematoma, especially if mixed with urine, is almost sure to become infected and produce a perirenal abscess if the patient lives so long. The patient is likely, however, to die of hemorrhage. This is sure to be the case when the renal vein itself or one of its larger branches is ruptured. Death comes on in the course of 24 or 48 hours.

When the kidney has been displaced, either slowly (floating kidney) or suddenly, and great pain persists, either with or without rise of temperature, indicating pyonephrosis, the kidney should be approached by an incision beginning on the outer margin of the overlying quadratus lumborum muscle just below the edge of the last rib, and extending downward to the crest of the ilium and then curved outward for about half a finger's length. Through this opening the kidney should be carefully reached (by dividing the perirenal fat with dull instruments or with the fingers) and carefully drawn out through the fat, and even out of the depressed edges of the wound. It will stay in the wound if it is slightly twisted like a button. Here it can be examined. The ureter should be found on the lower side. There should be no blood. The kidney is then allowed to sink back under the skin, but should be held within the muscular wound by a strip of gauze passed under the upper pole. The skin and muscle should then be partially coapted with sterile silk or silver wire. The gauze should be carefully and slowly removed about the fourth day, when the sutures are removed, and the resulting wound allowed to close slowly, with a diminishing iodoform gauze tampon.

When an injury of the kidney results in a large **hematoma,** without bloody urine, without symptoms of severe hemorrhage, and without any rise of temperature indicative of sepsis, it is enough to keep the patient in bed, apply cold, and wait.

When, however, a perirenal hematoma is accompanied by symptoms of gradually increasing anemia, rapid pulse, thirst, low temperature, pallor, and delirium, the kidney must be approached at once by the method mentioned and the ruptured kidney tamponed, or the bleeding vein compressed by a forceps left on for 24 or 48 hours. When the ruptured kidney cortex is tamponed with iodoform gauze, it may sometimes be necessary to pass one or two large silk sutures through the kidney from side to side to hold the tampon in the rupture. In such a case it is necessary to drain the perirenal space for a week or more.

When the cortex of the kidney is completely ruptured and the hematoma contains urine as well as blood, the treatment mentioned is imperative, but the drainage must be continued much longer.

When a large or small hematoma becomes infected after weeks or months, it gives rise to sepsis and abscess formation—the so-called perirenal abscess—and it must be opened and drained. The incision need not be quite so extensive as that described, but should be in the same line, and 3 inches or more in length. Perirenal abscess often occurs without the history of injury; the treatment is the same.

The diseases of the kidney for which surgical treatment is necessary may be grouped under three heads: (1) Pus-diseases; (2) tubercular diseases; (3) tumors.

Pus microbes may reach the pelvis of the kidney by way of the urethra, bladder, and ureter, and, having injured the ureter by forming granulations and obstructing the outflow of urine, **pyonephrosis** results. The pus, which had probably been noticed in the urine, stops; chills and fever come on; a large tumor, at last, after weeks or months, appears in the lumbar and outer abdominal region. In such a case the cortex of the kidney becomes very much thinned out, and its secretion stopped. The heart is usually hypertrophied. The treatment is obvious. The dilated kidney should be at once carefully opened, as in the case of, and in the same place as, rupture, even though it seems to "point" in front. Drainage must be kept up, and, if necessary, a subsequent operation done to remedy any defect in the ureter.

Pus infection sometimes reaches the kidney, especially in the course of typhoid or other infectious diseases, by way of the circulating blood, producing an infarct, and afterward an abscess, which may rupture outwardly and result in a perirenal abscess, or into one of the calices and produce a pyonephrosis. Multiple abscess of the kidney with pyonephrosis follows infection of the urethra, bladder, and ureter, especially in certain cases of gonorrhea and in catheterization during confinement, and as a part of a general pyemia. In the former case nothing avails except the complete and prompt removal of the whole kidney, while in the latter case we are helpless to offer any relief at all.

In some persons, in certain conditions of digestion and elimination, and in certain locations the crystallizable matter of the urine is precipitated in the renal tubules, in the calices, or in the pelvis of the kidney. When these crystals are small, they pass off in the urine without being noticed. Sometimes they remain behind and furnish centers about which, according to well-known principles of crystallization, further deposits take place.

Such masses of crystals are called **renal calculi** when they are found in the calices or pelvis of the kidney, ureteral calculi when they are found in the ureter, and vesical calculi when they are found in the bladder. They often remain unrecognized for years, and grow to a large size (2 to 5 ounces). They make themselves known by terrible pain whenever they pass down the urinary tract or obstruct the flow of urine. Small stones less than a centimeter in diameter pass down the ureter in the course of 10 to 40 hours of great agony, and are then passed out of the bladder through the urethra with relative ease, especially if the urethra is cocainized and dilated with a large sound. The patient should take such a position as to bring the stone into the urethra at the beginning of emptying a full bladder. When a larger or smaller stone is retained in the bladder, it grows, and sooner or later gives rise to the symptoms of vesical calculi.

Even a very small stone passing down the ureter may give rise to unendurable pain, coming on in paroxysms at intervals of a few minutes, or it may pass off after many paroxysms weeks or months apart. Sometimes the passage of quite a large stone through the ureter is unnoticed or produces only a dull pain in the side and back. The pain is, however, usually worse at the beginning of the ureter, at the constriction at the brim of the pelvis, and at the perforation of the bladder. The pain is often referred to the inside of the thigh, to the testicle, or to the labia, but as it grows severe it settles in the side and is accompanied by tenderness over the ureter and kidney. The treatment is warm baths, hot applications, and large doses of morphin. Vigorous catharsis and a liberal liquid diet, with rest in bed, must be prescribed. If the pain continues longer than 2 days, and the temperature rises more than a degree or two, the region of the stone has probably become the site of infection.

One of the most serious consequences of calculi in the urinary tract is the almost inevitable microbic pus infection which sooner or later surrounds the stone. Suppuration about the stone produces pyonephrosis, either complete or partial. When the pus stops discharging itself through the bladder, either because the stone acts as a valve in the ureter or because the ureter has been deformed and obstructed, the kidney becomes distended and the patient has all the symptoms of sepsis. Then the kidney must be approached as described above, the stone or stones removed, and the pelvis of the kidney drained. A subsequent operation may be required to repair any remaining obstruction of the ureter.

The removal of a stone in the ureter requires unusual operative procedure, which can be undertaken only on very exact diagnosis and under most favorable circumstances. At the bladder end of the ureter in women the stone may sometimes be easily helped into the bladder by simple digital manipulation through the vagina or rectum.

Tubercular infection reaches the kidney through the circulation, when it produces a double-sided and inoperable miliary tuberculosis or a tubercular disease confined to a single focus of infection, primarily through the external genitals, the urethra, prostate, bladder, and ureter. Primary renal tuberculosis, the so-called renal phthisis, is a little less frequent than renal tuberculosis, going on after tubercular epididymitis, tubercular prostatitis, and tubercular cystitis. This condition is slow in its onset, insidious in its progress, and, after both kidneys are attacked, absolutely unfavorable in prognosis. The diagnosis is made by discovering tubercular nodules in the epididymis, seminal vessels, and prostate, by recognizing tubercular bacilli in the semen or urine, by discovering tubercular ulcers of the bladder, and by finding the ureter from the tubercular kidney enlarged. The crucial test is made by catheterizing the ureters and finding tubercle bacilli on the one side, with diminished urine, and healthy and increased urine on the other side. The treatment for tuberculosis of the kidney is removal of the tubercular kidney and ureter and all peripheral tubercular tissue, the seminal vesicles, the prostate, the testicle, and the cord.

Hydronephrosis. — Complete hydronephrosis is due to partial obstruction of the ureter. Its treatment is repair of the ureter, a difficult and complex operation. Partial hydronephrosis is due to partial obstruction of one or more of the infundibula. It may be treated by exposing the kidney, as described before, and cutting away with the scissors the wall of the cyst and destroying the remaining mucous membrane with a solution of zinc chlorid 1:40.

The adrenal tumors of the kidney usually grow in adults from remnant of adrenal tissue left between the lobules of the kidney. They do not, as a rule, invade the kidney substance, but displace it. They can generally be enucleated, and after such removal they show no tendency to recur. When they are of large size, they are likely to break down, and extensive hemorrhages occur in the tumor substance, sometimes invading the surrounding tissues. If one of these adrenal tumors growing near the pelvis of the kidney breaks through into the pelvis itself, bloody urine follows immediately. These tumors sometimes produce the normal secretion of the adrenal gland in too great a quantity. Then the patient's heart is slowed, his capillaries contracted, and his skin blanched. He has severe headaches. His arteries rapidly undergo sclerosis, and apoplexy is apt to occur even in the young. Some adrenal tumors show a tendency to metastasis in which the lungs and bones are usually conspicuous.

These tumors should be enucleated from the kidney when possible; when this procedure is impossible, a part of the kidney should be removed.

Malignant tumors in the adult are usually hypernephromas, or carcinomas. The former are the more common. Many tumors formerly supposed to be carcinomas were undoubtedly hypernephromas. Sarcomas are rare. In children they may attain a very large size in a short time. Secondary or metastatic carcinomas of the kidney are not fit for surgical treatment. In primary carcinoma the right kidney is a little more frequently attacked than the left. Men are more often affected than women. Carcinoma sometimes follows long-neglected stone in the kidney and pyonephrosis. Primary carcinoma appears about the age of 50 to 60. Less than 1 percent of all primary carcinomas appear in the kidney. The diagnosis is made by the appearance of blood in the urine, pain in one side, tenderness and tumor in the region of the kidney, loss of weight for several months, and slight cachexia. Some latent cases show no blood in the urine and no tumor: say, one-third of all. Some cases show no tumor, but exhibit more or less frequent hematuria: say, one-tenth. Perhaps one-third of all cases exhibit both bloody urine and palpable tumor (these are the ideal cases for diagnosis), while the remainder show palpable tumor but no hematuria. The crucial test is the discovery of shreds of carcinoma tissue in the bloody urine. The tumor is usually nodular, attached to the kidney, moving with respiration. When obstruction results from clots in the ureter, the symptoms are like those in the passage of small renal stones. The blood-clot then resembles a black earthworm of enormous length.

Every case of hypernephroma and primary carcinoma of the kidney should be treated by complete removal of the affected kidney after the health and competency of the opposite kidney have been demonstrated.

The diagnosis of disease of the kidney is made by palpation, which in thin persons will discover the normal kidney and any tumor of considerable size; by percussion, which will sometimes discover the normal and always the greatly enlarged kidney; by urinary examination; by exploratory puncture; by photography or fluoroscopy with the X-rays, which will often discover stone; and by incision and direct palpation.

Summary.—The following adages should be considered in all cases requiring operations on the kidney:

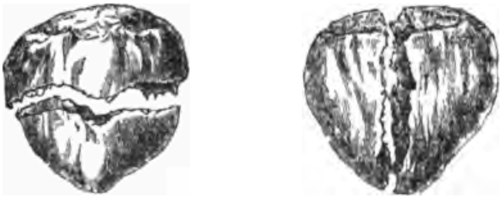
1. One healthy kidney should be demonstrated by catheterizing the ureters before any considerable operation is undertaken on the opposite organ.
2. The kidney should be extirpated only for malignant disease, for tuberculosis, for rupture of the renal artery or vein, for irreparable loss of the ureter and for pyonephrosis when the kidney is riddled with multiple foci of suppuration, for the removal of which a nephrotomy has proved inadequate. Even a small portion of cortical substance should be left, as it shows great reproductive power.
3. In pyonephrosis the abscess should be freely opened and drained, and all reparative procedures on the obstructed ureter should be left to a subsequent operation.
4. An operation on a healthy kidney is more likely to precipitate an acute nephritis in the opposite kidney than a much more severe operation on a sick kidney.
5. The emergency operations on the kidney are for hemorrhage about the kidney in rupture of the kidney or rupture of the renal vein, torsion of the ureter in wandering kidney, and pyonephrosis.
6. Chloroform is the best anesthetic for kidney operations, but a pyonephrosis may be opened with Schleich's local anesthesia or with the use of ethyl chlorid spray.
7. Hypertrophy of the heart is usually observed in any disease impairing the function of the kidney.
8. Renal hematuria from an apparently healthy kidney has been repeatedly observed.
9. Operations on the kidney by the abdominal way are much more dangerous to the patient than similar operations by the lumbar incision.
10. Hydronephrosis is the result of partial obstruction of the ureter. Complete obstruction without infection results in atrophy and disappearance of the kidney.
11. Percussion is of little use in diagnosis.
12. Only in thin people can the lower pole of the normal kidney be palpated, and then only on inspiration and expiration.
13. Auscultatory percussion is of much value. See KIDNEY (Stone, Movable), NEPHRITIS, PYELITIS, etc.

KINO.—The inspissated juice of *Pterocarpus marsupium*, found in India, and similar in action to tannic acid. It contains 75 percent of a variety of tannin named *kinotannic acid*, which gives a greenish precipitate with persalts of iron; also a crystalline, neutral substance, *kinoin*, and *kino-red*, gum, pectin, etc. Dose, 5 to 10 grains. It is used mainly as a constituent of gargles and diarrhea mixtures. The tincture in dram doses is one of the best remedies for the diarrhea which results from the disuse of opium or morphin. **K., Tinct.**, 5 percent of the drug. Dose, 1/2 to 2 drams.

KNEE-JERK.—See JERK, REFLEXES, NERVOUS DISEASES (Examination), LOCOMOTOR ATAXIA.

KNEE-JOINT, DISEASE.—See JOINTS (Diseases), EXCISION OF JOINTS.

KNEE-JOINT, INJURIES.—**Fracture of the patella** is a frequent injury due to direct violence, producing an oblique or stellar fracture; or to indirect violence, sudden muscular traction of the quadriceps, producing transverse fracture (traction fracture).



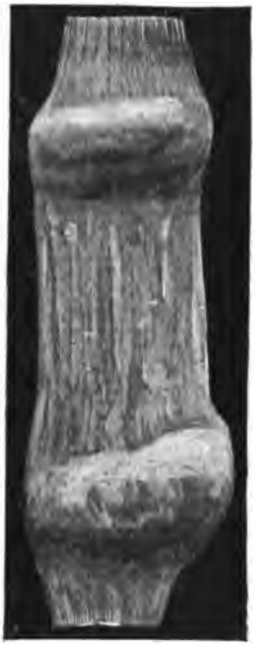
TRANSVERSE AND VERTICAL FRACTURE OF THE PATELLA. —(*Spencer and Gask.*)

Fracture the result of direct violence is seldom accompanied by the same degree of diastasis of fragments as fracture the result of muscular contraction, in which there frequently occurs an extensive laceration of the aponeurotic layers passing alongside the patella; without this laceration wide separation of the fragments cannot occur.

The patella is fully inclosed in the capsule of the joint, and hemorrhage is into the joint. Exceptionally, this may be excessive and distend the capsule.

When only a small piece at the edge of the patella is separated, and if the periosteal covering remains intact, the diagnosis may be difficult and doubtful. But when the fracture is transverse and is accompanied by some diastasis of the fragments, the diagnosis lies immediately at hand. This fracture is peculiar in that there may result a very good and useful limb, with comparatively wide separation of the fragments and fibrous union entirely, while sometimes well-placed fragments united by bony union occasion a permanent impairment functionally.

Treatment.—In fractures from direct violence, when there is likely to be little or no separation, treatment is comparatively easy, consisting in fixation by means of a posterior splint and roller bandage. The danger here is not nonunion, but ankylosis. If a distending hemorrhage has occurred into the joint, it should be removed by aspiration. Massage of the quadriceps should be practised almost daily, and passive motion begun as early as the third week. At the end of 6 weeks dressings can be discarded and the patient permitted to go about.



Ununited Fracture of the Patella.—(*Spencer and Gask.*)

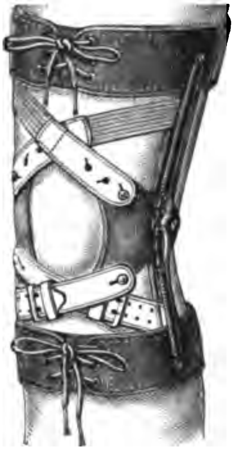
It is in the transverse fracture, the result of muscular traction, that the serious difficulty occurs. Here the fragments are likely to be widely separated, owing to the tearing of the lateral aponeurotic layers along the sides of the patella. The aponeurosis covering the patella becomes first very much stretched, and when it finally tears, a retracted fringe projects between the fragments. This fringe sometimes prevents an osseous union, even when the fragments can be closely apposed.

Above all, it is the condition of the quadriceps extensor muscle which most demands attention. Even when comparatively good union is attained, a useless limb may result because of the atrophic condition of the muscle which has occurred as the direct result of the treatment that brought the fragments close together and permitted a good union. To effect apposition of the fragments it is necessary to practically paralyze the muscle with the roller bandage. The nutritive disturbance thus brought about, together with the atrophy resulting from the prolonged inactivity of the muscle, leaves the muscle in a crippled condition, from which it does not recover. This fact has lead to the treatment of this condition by daily massage alone (kneading and tapotement), the effort being made at the same time to bring the fragments nearer together. Very good functional results are reported as a result of this treatment. A better plan of conservative treatment is to combine this valuable method with the effort to approximate the fragments directly. This is accomplished by means of a posterior splint, applied with the leg extended and the thigh flexed, so relaxing the quadriceps. Straps of adhesive plaster now catch the upper and lower fragments, cross each other, and are stuck fast over the posterior aspect of the splint, so pulling the lower fragment up and the upper fragment down. A circular strip over the fragments may be found necessary to keep them from tipping. A figure-of-eight bandage may reinforce these straps. The quadriceps is now to be massaged daily, chiefly from above downward, seeking thus to bring down the upper fragment. Complete failure of union and adhesion of the upper fragment to the anterior surface of the thigh are rare and, of course, very unfavorable occurrences.

Subcutaneous suture by means of wire, tendon, or silk is recommended; but of operative measures only the open **bone suture** is to be advised. Chromicized catgut answers this purpose well. The sutures need not penetrate the fragments of bone; by being passed through the aponeurotic layers over and to the sides of the patella, they are able to bring the fragments in apposition. This procedure is only to be attempted by a skilled surgeon, as the knee-joint is necessarily opened, and the occurrence of sepsis here may be fatal either to the usefulness of the joint or to the life of the patient. When this operation is undertaken, it is advisable to use rubber gloves, as thereby the chances of infection are undoubtedly diminished. Taking into account the danger of this operation, and the comparatively useful limbs which result from inte ligent and careful conservative treatment, the conclusion is clear that conservative treatment is best for the large majority of cases. In special cases, as in robust young men who are dependent on strong legs for their daily bread, the direct suture in competent hands is certainly advisable.

To perform this operation, a longitudinal incision is made over the center of the joint, which is opened, and the fragments of the patella are exposed; any blood-clot which is present in the joint or between the fragments is turned out, and the fragments themselves are cleared of any aponeurotic and fibrous tissue which may be found lying between and over their broken surfaces. Each fragment is then bored obliquely with a drill, taking care not to reach its cartilaginous surface. Sutures of silver wire or of heavy catgut are then passed through the drilled holes, and the fragments having been drawn together, the ends of the wire are twisted, cut short, and then hammered down on the bone, where they may be allowed to remain permanently, without causing any irritation.

Kocher's method of treating fractured patella consists in passing a stout silver wire completely around the bone. A needle in a handle is passed through the ligament of the patella, through the tendon of the quadriceps, and out through the skin. It is then threaded and drawn back again; the broken fragments are drawn together, the wire twisted up over something, to protect the skin, and the openings dusted with iodoform. The limb is then placed upon a back splint, bandaged, and kept in this position for 3 weeks; at the end of this time the wire is cut, drawn out of the wound, and the sore points that are left dusted with iodoform until the parts are healed.


Brace for Dislocated Semilunar Cartilage. The mechanism permits flexion and extension, but prevents rotation.—(*Walsham.*)

Knee-joint dislocations are very rare, though displacement of the semilunar cartilages, especially following violent rotatory movements with flexed knee, are more frequent.

Dislocation of the semilunar cartilages of the knee joint (*subluxation, internal derangement of the knee*) follows a twist of the partly flexed knee. The cartilages are torn from the tibia by rotation of the leg; the internal cartilage being the one usually affected. Any of its attachments or even the cartilage itself may be ruptured.

The **symptoms** are severe pain in the knee and effusion into the joint which is locked in flexion; extension being impossible. This locking may not be present; such cases are sometimes diagnosed as sprains. In the latter tenderness is more generalized and extension may relieve rather than increase the pain. The displaced cartilage may be felt, but more often palpation will reveal nothing but marked tenderness along the front of the upper surface of the tibia. Recurrences are frequent.

The **treatment** is reduction by increasing the flexion, rotating the leg, making firm pressure over the situation of the displaced cartilage, and extending the leg. Often spontaneous reduction occurs before the surgeon is called. The synovitis should be treated and the knee immobilized for five or six weeks. In order to prevent recurrence an elastic knee-cap should be worn for several months. If relapses are frequent a brace may be applied, or the joint may be opened by a curved incision along the upper edge of the tibia, and the cartilages stitched to the periosteum with catgut, or excised if they are ruptured.

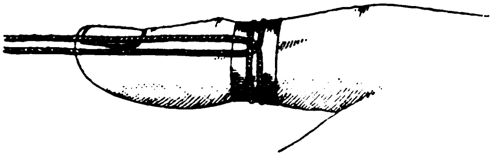
Complete displacements may occur **forward, backward**, and **laterally**; they are combined with tearing of the lateral and crucial ligaments, result from the direct application of great force, and hence are usually complicated injuries. Such an injury is, of course, easily manifest. Reduction is by direct pressure and traction. **Rotatory dislocation**, from twisting, also occurs. In all dislocations of the knee the patient should wear an elastic knee-cap or a brace for several months after restitution of the joint.

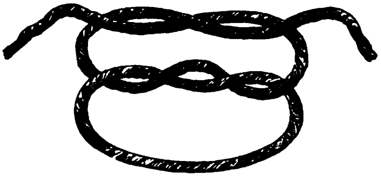
Dislocation of the patella may be outward, inward, and vertical (rotated about the long axis, this embracing also its complete reversal). The outward displacement is most frequent. These conditions are easily recognised, except the completely reversed form, which is the greatest rarity. Complete extension of the leg with flexion of the hip will usually permit reduction.

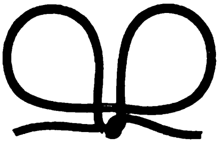
The fibula may be dislocated from the tibia at its upper (and lower) extremities. The head may be dislocated forward or backward. This injury may be associated with isolated fracture of the upper tibia. There is inability to bear weight with mobility of the head. After reduction a molded splint should be applied to fix the head.

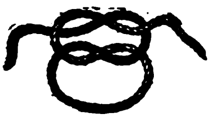
For further discussion of injuries of the knee-joint, see Joints (Injuries).

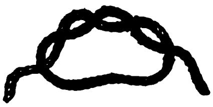
KNOCK-KNEE.—See Genu Valgum.

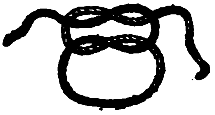

Clove-hitch Knot.


Combined Surgeon's and Reef Knot.


Staffordshire or Tait's Knot.


Granny Knot.


Surgeon's Knot.


Reef Knot.

KNOT.—An interlacement of ends or parts of one or more cords or threads so that they cannot be readily separated. **K., Clove-hitch,** a knot consisting of two single, contiguous loops, the free ends toward each other. It is used for making extension in the reduction of dislocations. **K., Double.** Same as K., Friction. **K., False.** Same as K., Granny. **K., Friction,** one in which the ends are wound twice around each other before they are tied. **K., Gerdy's Extension,** resembles the clove-hitch; it is employed in making extension of the leg at the ankle. **K., Granny,** a tie of a cord in which in the second loop the end of one cord is over, and the other under, its fellow, so that the two loops do not lie in the same line. This knot may easily be converted into a slip-knot. **K., Reef,** a knot so formed that the ends come out alongside of the standing parts and the knot does not jam. It is also called square knot. **K., Sailor's.** Same as K., Reef. **K., Square.** Same as K., Reef. **K., Staffordshire,** a knot used in ligating the pedicle in ovariotomy. The ligature is passed through the pedicle, and withdrawn so as to leave a loop, which is passed over the tumor and one of the free ends is then drawn through the loop; both ends are then passed through the pedicle, tightened, and tied. It is also called Tait's knot. **K., Stay,** a term applied by Ballance and Edmunds to a knot formed by two or more ligatures in the following way: On each ligature separately is made the first hitch of a reef knot, which is tightened so that the loop lies in contact with the vessel, without constricting it; then, taking the two ends on one side together in one hand, and the two ends on the other side in the other hand, the vessel is constricted sufficiently to occlude it, after which the reef knot is completed. The simplest method of completing the knot is to treat the two ends in each hand as a single thread, and to tie them as if completing a single reef knot. **K , Surgical,** a double knot made by passing the thread twice through the same loop. **K., Tait's.** See K., Staffordshire.

KOLA.—The nut or seed of *Cola acuminata,* used in parts of central Africa as a substitute for tea and coffee. It contains both *caffein* and *theobromin, tannic acid* and a glucosid substance named *kolanin,* which, in the presence of a ferment, splits up into free caffein and glucose. The Kola nut is said to be stimulant and aphrodisiac. It improves the appetite and the digestion, and is useful in gastric catarrh and in the dyspepsia of alcoholic subjects, as an adjunct to other treatment; also in asthma of both the nervous and cardiac forms. It is especially efficient in atonic diarrhea; and in gastrointestinal irritation with looseness of the bowels, a restricted diet and Kola-wine are frequently all that is needed.

KOOMISS.—See KUMYSS.

KOUSSO.—See CUSSO.

KRAMERIA (Rhatany).—The dried root of *Krameria triandra.* It contains 20 to 45 percent of *rhatania-tannic acid,* also *rhatantin,* an alkaloid, and wax, gum, etc. Dose, 10 to 20 grains.

It may be employed for the same purpose as tannic acid except as an antidote to antimony. It has been used as an injection for fissure of the anus, as a local application to spongy gums, as a tonic for debilitated subjects, in chronic diarrhea, also in passive hemorrhages and mucous discharges, as menorrhagia and leukorrhea.

Preparations.—Extractum K., aqueous. Dose, 5 to 10 grains. **Fluidextractum K.** Dose, 5 to 20 minims. **Tinctura K.,** 20 percent. Dose, 1/2 to 2 drams. **Syrupus K.,** has of the fluidextract 45 parts, with syrup 55. Dose, 1/2 to 4 drams. **Trochisci K.,** each troche contains nearly 1 grain of the extract, with tragacanth, sugar and orange-flower water.

KYPHOSIS.—See SPINE (Curvature).

KUMYSS (Koomiss).—An effervescing fermented liquor originally prepared by the Tartars from mare's milk, but now imitated with cow's milk by adding sugar of milk, fermenting in open tanks, skimming off the casein and butter, then bottling during active fermentation. Its successful preparation depends on its undergoing slow fermentation for 5 to 10 days in a cold room, at 40° F. If the temperature be higher than 50° the fermentation will be of the acetous variety, and will result in sour milk with heavy curd, feeble effervescence and repulsive taste. Kumyss has an acidulous and peculiar taste. It is a powerful diuretic, especially in cold weather, and in warm weather it causes free perspiration. It is stimulant and tonic, increases the nutrition of the body and produces considerable somnolence. The stomach tolerates it well, even when it rejects all other food. It is easily assimilated and very nutritious.

Kumyss is an invaluable article of diet in many wasting diseases, especially phthisis. It is of great benefit in dyspepsia, the diarrheas of children, convalescence from acute maladies, chronic affections of the kidneys, and other cachexiæ. In cases of feeble digestive power an ounce every hour is sufficient, but as its digestion and assimilation increase it may be given almost *ad libitum,* and when used with other food a half-pint may be taken after each meal. Each quart is estimated to contain four ounces of solid food, besides from 1 to 3 percent of alcohol. See KEFIR.

L

LABARRAQUE'S SOLUTION.—Solution of chlorinated soda; an aqueous solution of several chlorin compounds of sodium, containing at least 2.4 percent by weight of available chlorin prepared by adding together aqueous solutions of monohydrated sodium carbonate 65, and chlorinated lime 90, then adding water to 1000. Dose, 10 to 30 minims (average, 15 minims) in 20 parts of water. See DISINFECTION.

LABIA, DISEASES.—There is a type of inflammation of the labia that resembles erysipelas in its extensive swelling and redness, but differs from it in the fact that it does not spread. It subsides in a few days, but if severe, it may produce sloughing. It is seen in typhus and small-pox, and after delivery. A wound may be found, or no history of any violence is to be elicited, without pregnancy or previous illness. The affection is usually bilateral. Treatment requires separation and support of the labia, and the application of an evaporating lotion like the following:

℞.	Solution of lead acetate,	each,	℥ ss
	Rectified spirit of wine,		
	Water,		O j.

If a tendency to gangrene is seen, the actual cautery is needed to separate the slough, followed by cleansing by frequent antiseptic lotions.

Erysipelas may attack the labia, as any other part of the body.

Herpes of the labia runs its usual course, requiring drying and sedative applications, such as bismuth, lead ointment, or an ointment containing bismuth, 30 grains; morphin, 10 grains; and vaselin, 1 ounce.

Abscess of the labia is usually unilateral, generally in Bartholin's gland, and is due to gonorrhea or traumatism. It forms a tender, fluctuating, and nonreducible swelling which, if left alone, will burst and refill, and thus continue indefinitely. The gland must be dissected out to obtain effectual cure. See BARTHOLIN'S GLANDS.

Eczema of the labia is often found in elderly, plethoric, and gouty women and in the subjects of diabetes. Antacid remedies and purgatives are given, combined with rest, the avoidance of alcohol, and a restricted diet.

℞.	Magnesium sulphate,	ʒ j
	Magnesium carbonate,	gr. x
	Aromatic spirit of ammonia,	♏ xx
	Water,	℥ j.

Give twice daily.

For local application, lead ointment, zinc ointment, and an ointment of the nitrate of mercury and zinc ointment in equal parts may be used, the last being used in chronic and indolent conditions, the first when the parts are very sore. Silver nitrate, 20 grains to 1 ounce of water, may be applied once or twice a week.

Warts on the labia, when nonsyphilitic, are acuminate, and not flat and overhanging. They are associated with uncleanliness and unchastity, but are not proof of the latter. A powder of calomel and zinc oxid may be used; they may be cut off if large, the hemorrhage being controlled by pressure, styptics, or the Paquelin cautery.

Syphilitic warts, mucous tubercles, or condylomata are moist, broad, overhanging, white patches. Locally, black wash should be applied, and mercury given by the mouth.

Epithelioma of the labia occurs as a warty growth, accompanied by ulceration, which shows no tendency to healing.

The treatment of epithelioma is removal of the growth—best by the knife or Paquelin cautery—together with a good margin of healthy tissue. The inguinal glands on the corresponding side should be removed also if the growth is at all advanced.

Innocent growths, as lipomata, are met with in the labia; and **elephantiasis** of the labia is occasionally encountered. These growths are to be treated by removal, if their bulk causes inconvenience. The labia may also be the seat of lupus and swelling or of hematoma. Boils sometimes are found here, and are distressing because of pain and the suspicion they suggest. Hydrocele of the labia must be carefully differentiated from hernia, and probably the safest practice is to cut down on the tumor, open it, and remove the sac. See VULVA.

LABOR.—That natural process by which the fetus and its appendages are expelled from the uterus and vagina at the normal expiration of pregnancy. This should be about 280 days after appearance of the last menstruation.

Causes.—Just why labor should occur at this particular time is unknown. It has been thought to be due to: (1) *Periodicity*, the muscular action of the uterus being particularly strong at the tenth period; (2) *overdistention of the uterus*, which is followed by retraction of the uterine muscle and expulsion of the fetus; (3) *maturity of the ovum*, the decidual cells undergoing fatty degeneration toward the end of pregnancy, thus causing a "loosening" of the ovum; (4) *nervous impulse*, reflected from the central nervous system through the sympathetic to the uterus; (5) when the uterus is incapable of further distention the fetus becomes practically a *foreign body*, and as such is expelled.

Signs. 1. **Subsidence of the Uterus.**—This occurs about 4 weeks before term in primiparæ, 2 weeks before term in multiparæ. It is due to retraction of the abdominal muscles, which forces the presenting part and lower uterine segment into the pelvic cavity. The size of the abdomen is decreased, the pressure-symptoms above, such as irritability of the stomach and difficult breathing, are relieved; and the pressure-symptoms below, as edema and excessive vaginal secretion, are increased. Should subsidence of the uterus not occur, it usually indicates a malposition of the child or some obstruction, as a contracted pelvis or oversized head.

2. **Pains.**—These are felt over the sacrum and lower part of the abdomen. They are intermittent in character, occurring at first, about every 15 minutes, and lasting about 1/2 to 1 minute. They should not be confounded with pains due to intestinal colic or to rheumatism of the uterine muscle.

3. **Show.**—This is a small plug of blood-tinged mucus which has occluded the cervical canal during pregnancy, and which is now expelled with the first few pains.

4. **Dilatation of the Os.**—This is by far the most important sign, and when accompanied by effacement of the cervical canal, is a positive indication of labor.

Stages.—Normal labor may be divided into 3 stages:

1. **The Stage of Dilatation and Effacement.**—This begins with the first pain and lasts until full dilatation of the os is accomplished. The average time required for the completion of the first stage is, in primiparæ, 10 to 12 hours; in multiparæ, 6 to 8 hours.

2. **The Stage of Expulsion.**—This begins with full dilatation of the os, and lasts until the child is expelled from the vagina. Its average duration is, in primiparæ, 2 to 4 hours; in multiparæ, 1 to 2 hours.

3. **The Placental Stage.**—This covers the period which elapses between the birth of the child and the expulsion of the placenta and membranes. Its average duration is 15 minutes.

Management.—A call to an obstetric case should be answered immediately. The strict observance of this rule may prevent many complications, such as malpresentations, lacerations of the perineum, postpartum hemorrhage, and asphyxia of the new-born.

Certain articles are indispensable to the proper management of an obstetric case. **The patient should provide** the following: A half-pound can of ether, 2 ounces of brandy, 4 ounces of vinegar, 4 ounces of tincture of green soap, 1 dozen tablets of mercuric chlorid, a large new sponge, a skein of bobbin, a fountain syringe, a bed-pan, a new soft-rubber catheter, 4 ounces of absorbent cotton, a bottle of carbolized vaselin, 2 yards of unbleached muslin, 1 pound of salicylated cotton, 5 yards of carbolized gauze, 8 yards of nursery cloth, and 2 dozen clean towels.

The physician's **obstetric bag** should contain 2 pairs of forceps, preferably the Simpson and the Tarnier axis-traction; a Sims speculum; perineal needles and needle-holder; half a dozen hemostats; a pair of blunt-pointed scissors; a set of Barnes' bags; a hypodermic syringe; iodoform gauze; fluidextract of ergot; tablets of nitroglycerin; and a 2 percent solution of silver nitrate.

The lying-in room should be large, sunny, and well ventilated, preferably by an open fireplace. It should not contain a stationary wash-stand, nor should it have any connection with a sewer, bath-room, or water-closet. If it is heated by a hot-air furnace, the intake for the air and the sanitary condition of the cellar may need investigation. No decomposing food, unemptied bed-pan or commode should be left in the room for any length of time.

The water used for douches or for washing off the vulva or perineum should be sterilized by boiling it for at least one-half hour.

The patient should receive a full bath before labor (special attention being given to the genital region), and be supplied with clean clothes. The mattress on which she lies should be clean and not soiled with discharges of previous labors or other putrescible material; it should be protected by a perfectly clean rubber cloth. The pads on which the buttocks rest during and after labor should be of nursery cloth, previously boiled and dried. The material used to wipe off the genital orifice, mouth of the urethra, and perineum should be absorbent cotton, soaked in mercuric chlorid solution (1:1000) for one-half hour. After labor an antiseptic vulvar pad, composed of salicylated cotton and carbolized gauze, should be worn during the continuance of the lochial discharge. These pads should be changed and the vulva cleansed 4 to 6 times in the 24 hours. If there is any pathologic discharge, the vagina should be thoroughly cleansed by scrubbing with tincture of green soap, hot water, and pledgets of cotton, followed by a mercuric chlorid douche (1:2000); this followed by a douche of sterile water.

The physician should not carry infectious germs upon his person or clothing. He should not attend an obstetric case after seeing a contagious disease without first taking a full bath and changing his clothing. The preparation of his hands should consist of 10 minutes' scrubbing with tincture of green soap, hot water, and a stiff nail-brush followed by scrubbing in alcohol, and immersion in mercuric chlorid solution (1:1000) for 2 minutes.

The instruments used about the patient should first be boiled for 10 minutes. If boiling injures them, they should be immersed in mercuric chlorid solution (1:1000) for one-half hour.

Examination of the patient must be made to determine the position and presentation of the child, its approximate size, the condition of the perineum, the dilatability of the vagina, the size of the pelvis, the amount of dilatation of the cervix, and the effectiveness of the pains. To ascertain the above facts an abdominal examination should first be made, the patient lying upon her back, with knees drawn up and shoulders slightly raised; followed by a vaginal examination, the patient lying in the Sims position. The vaginal examinations should be made as infrequently as possible, and always visually, so that the finger may not be contaminated by groping over the perineum or vulva before entering the vagina. By observing these two precautions the dangers of sepsis are greatly reduced.

During the first stage of labor the patient should be allowed to occupy her time very much as she pleases. The lower bowel should be thoroughly emptied by an enema of a pint of warm soapsuds and a dram of turpentine. The vaginal examinations should be made every hour or two, and when the os is dilated to the size of a silver dollar, she should be placed in bed, lying upon that side toward which the fetal back looks. If the patient is nervous, or if she complains very much of the severity of the pains, she may be given chloral hydrate, in 15 grain doses, every 20 or 30 minutes, until she has taken 45 grains. A cup of beef-tea or a glass of sherry or milk will oftentimes act beneficially.

During the second stage of labor the examinations should be made more frequently—every 10 or 15 minutes.

If, in a multipara, the membranes have not ruptured, they should be perforated with the finger or with some aseptic instrument. Care should be exercised that the child's scalp or the lower uterine segment may not be injured.

If the pains are very severe and if the patient complains excessively, chloroform or ether may be given. The latter is probably the safer. It should be given only during the second stage, and never in sufficient quantity to produce complete anesthesia. See ANESTHESIA.

During this stage the expulsive force of the abdominal muscles may be much increased by the use of a "puller." As the head advances toward the vulvar outlet, precaution must be taken to prevent laceration of the perineum. This is best avoided by making firm backward and upward pressure against the occiput during pains; by restraining voluntary expulsive efforts during pains; and by securing expulsion of the head between pains.

When the head is born, support it with the hand, wash the eyes carefully with warm sterile water, and if the cord is coiled about the neck, loosen it or slip it over the head. By this time the next pain, which secures delivery of the shoulders, will occur. Should this be delayed, stimulate the uterus by friction through the abdominal wall; or grasp the sides of the child's face with the two hands, make downward and forward traction until the anterior shoulder appears under the symphysis, then upward and forward traction, until the posterior shoulder appears, finally downward and forward traction, the anterior shoulder and remainder of the body being extracted in rapid succession. As the child is born one hand should grasp the fundus to secure and maintain firm contraction. The child should be placed by the mother's side, with its face turned away from the maternal discharges. As soon as the cord stops pulsating it should be ligated and cut.

During the third stage of labor the patient should be carefully guarded against hemorrhage. A dram of the fluidextract of ergot should be administered to aid firm contraction; and irritation of the uterus, by friction through the abdominal wall, should be persisted in for 10 or 15 minutes. If, at the expiration of this time, the placenta has not been voluntarily expelled, the fundus should be grasped firmly between the thumb and 4 fingers; as soon as the uterus is felt to harden the fundus is compressed tightly, and firm downward and backward pressure is made in the direction of the pelvic axis. Very slight traction is made on the cord with the other hand, to guide the placenta through the cervix and vagina. The placenta should be received in some sort of a receptacle as it emerges from the vulva, and should then be carefully inspected; if it and the membranes are intact, and if the womb is firm, an abdominal pad and binder should be applied, all blood and discharges cleaned away, and the patient fixed comfortably in bed.

For immediate care of the infant see NEW-BORN INFANT.

LABOR, COMPLICATIONS AND SEQUELS.—See ECLAMPSIA, PERINEUM (Injuries), POSTPARTUM HEMORRHAGE, PUERPERAL FEVER, UTERUS, VAGINA, etc.

LABOR, DIFFICULT.—See DYSTOCIA, FETUS (Positions and Presentations), PELVIS (Contracted), etc.

LABOR, PREMATURE.—Expulsion of the fetus after it has become viable—after the sixth month of gestation.

The causes and clinical phenomena of premature labor have been discussed under ABORTION (*q. v.*).

The treatment is the same as labor at term.

Induction of Premature Labor.—This becomes necessary at times for the preservation of the mother's life. Not infrequently, too, it offers to the child its best or only chance for safe delivery.

Indications for the Induction of Premature Labor.—Besides the indications which were mentioned for the induction of abortion, we have the following: (1) Certain degrees of contracted pelvis (8 to 9.5 cm.); (2) placenta prævia; (3) grave systemic disease, as phthisis and advanced heart-disease; (4) habitual death of fetus just before term.

Method of Inducing Premature Labor.—The most satisfactory method is by catheterization of the uterus. The steps of this method are as follows: (1) Disinfect the cervical canal, vagina, vulva, pubes, and inner part of thighs by scrubbing thoroughly with tincture of green soap and pledgets of cotton, followed by a vaginal douche of mercuric chlorid (1: 4000); (2) two fingers of the left hand, previously sterilized and well lubricated with 5 percent carbolized oil, should now be introduced into the vagina, the middle finger pressed against the external os, which will gradually dilate until the tip of the finger is at or beyond the internal os; (3) an elastic silk bougie (No. 17 French), previously sterilized by soaking in cold mercuric chlorid solution (1: 1000) for one hour, is now passed along the groove between the middle and index-fingers until it enters the uterine cavity and extends from 7 to 9 inches between the decidua vera and decidua reflexa; (4) finally, the bougie is kept in position by a vaginal tampon of iodoform gauze. The patient then lies quietly in bed, labor beginning after a variable period, the average being 12 hours. If, at the end of 12 hours, there are no signs of beginning labor, a second and larger bougie may be inserted by the side of the first. If this fails, after the lapse of another 12 hours the cervix, which has become very much softened, may be easily dilated by means of Barnes' bags.

If there is any necessity for immediate delivery, the patient should be anesthetized, the cervix dilated with fingers or dilators, the membranes ruptured, and podalic version performed.

LABOR, TWIN.—See PREGNANCY (Multiple).

LACQUER POISONING.—Workers in lacquer, the base of which is the balsam of rhus vernicifera, are subject to a disease which resembles ivy poisoning, though the symptoms are more intense. It is met with especially in China and Japan. There is severe pruritus with edema and papules of the face and extremities and probable involvement of mucous membranes and conjunctivæ.

Treatment.—Soothing lotions such as lime water and sodium thiosulphate solution (1 to 8) or solution of aluminum acetate are indicated.

LACRIMAL DISEASE.

Diseases of the Lacrimal Gland.

Abscess and inflammation of the lacrimal gland are very rare. The diagnosis depends on the presence of swelling or the signs of abscess in the region of the gland. An abscess should be incised, and any inflammation of the gland treated with a mercurial ointment or potassium iodid.

New growths are mostly **adenomata. A chloroma** is a malignant greenish tumor which sometimes attacks the lacrimal gland. **Sarcoma** and **carcinoma** are also occasionally found in this location. However, disease of the lacrimal gland is so rare an affection that many men of vast experience have never seen a case. The treatment of a tumor is prompt excision.

Dacryops is a condition in which a lacrimal duct becomes occluded and the lumen full of secretion, forming a bluish tumor on the outer upper fold of the conjunctival sac. It should be opened with a fine needle.

Fistula of the lacrimal gland is usually the result of injury or operation. The fistula should be connected with the conjunctival sac, after which the dermal opening soon heals.

Diseases of the Lacrimal Passages.

The all-important sign of diseases of the lacrimal passages is the overflow of tears, or **epiphora.** The first purpose in treatment of such cases is to clear the passages so that the tears will run into the nose. However, we must remember that in oversecretion the tears will run over the cheeks. Thus, on a windy day or in emotional weeping there is not only extra secretion into the nose, causing sniveling, thus proving that the nasal duct is patulous, but, in addition, epiphora. Oversecretion of tears may be due to conjuctivitis, keratitis, an especially irritable trigeminus nerve, uncorrected ametropia, and a number of other causes.

Eversion of the puncta, or even of the lower punctum alone, will cause epiphora. We should immediately endeavor to correct any malposition, as the sequences of epiphora are very serious, eventually leading to ectropion. In cutting operations on the lids, or in the application of caustics, we must always be careful that the puncta are not involved, as eversion, with its annoying sequels, will result if this precaution is not taken.

Although it is always well to preserve the puncta, which have a physiologic function of importance in keeping solid, irritating bodies from the nasal duct and lacrimal sac, it is often necessary, for immediate drainage, to **slit the canaliculus** involved. This simple operation is performed as follows: The lower lid is drawn downward and outward, and slightly everted by the thumb of one hand, while the probe point of a canaliculus knife is introduced vertically with the other hand. When the knife is well inserted into the canal, its point is turned inward and slightly backward, reaching the inner wall of the lacrimal sac. During this maneuver the edge of the knife is turned toward the conjunctiva, and the whole length of the canaliculus is divided, close to the mucocutaneous junction by bringing the knife up boldly from the horizontal to the vertical position. In dividing the upper canaliculus the upper lid is made tense, and the knife is introduced into the upper punctum and passed into the sac in a direction downward and inward. If the canaliculus is very small, a fine-pointed conic probe should first be used to dilate it. There are various modifications of the operation—with a grooved director, fine scissors, etc. The wound should be examined at short intervals, and kept open with a probe.

Affections of the Canaliculus.—Obstruction of the canaliculus is often due to a foreign body, such as an eyelash, which not only occludes the canal, but scratches the cornea. The obstruction may be due to a stone in the canaliculus, called a **dacryolith.** Polypi of the canaliculi may grow so luxuriantly as to protrude from the puncta. The treatment in these cases is to remove the foreign body if it protrudes from the punctum; or, if the obstruction is due to a stone or polypus or there is absolute stenosis or obliteration of the canaliculus, it should promptly be slit to its full extent.

Affections of the Lacrimal Sac.—The lacrimal sac is lined with mucous membrane, which is subject to inflammation and catarrh like any other mucous membrane. Any condition which obstructs the free passage of the tears predisposes to disease of the sac, and particularly if the obstruction is in the nasal duct. The sac also becomes diseased by extension of any inflammatory process from the nose. **Inflammation** of the sac leads to **blennorrhea,** and this, in its turn, leads to **dacryocystitis,** or abscess of the lacrimal sac. The contents of a constantly suppurating tear-sac are very infectious, and although the patient may go on for many years with epiphora, conjunctivitis, and crusting of the lids in the morning, yet the infection may be so severe as to set up an inflammation which will eventually destroy the eye. The slightest abrasion of the cornea may become infected and a dangerous ulcer result.

Dacryocystitis.—The initial symptoms are conjunctivitis, local pain, and redness of the skin. The distended sac soon appears as a tumor involving the tissues near the inner canthus of the eye. If left to itself, this tumor may ulcerate and the pus burrow through the skin, establishing what is known as a **lacrimal fistula,** which may remain a lifetime, and become in itself a safeguard against a new attack. Often the distended sac loses its elasticity and becomes a permanent tumor, called **hydrops sacci lachrymalis.**

The diagnosis of simple catarrh, blennorrhea, or *hydrops* is easily made by emptying the sac with pressure of the finger: in catarrh, a watery secretion appears at the punctum; in blennorrhea there is more or less pus; in hydrops, the sac may empty into the nose and no secretion appear. Dacryocystitis and fistula need only be seen to be recognized.

Treatment.—Any nasal affection should be corrected, and a free passage for tears into the nose established. The latter is generally effected by the passage of sounds. Bowman's sounds or probes are usually employed. The canaliculus should be slit, and the following day the passage of probes commenced. It is optional which canaliculus is used, but the upper is shorter and easier to sound.

To pass a lacrimal sound or probe, the point of the sound must be passed along the floor of the slit canaliculus to the nose, until it is felt to strike against bony resistance; the sound is then rotated until it points downward; keeping close to the inner wall of the sac, the sound is then firmly pushed along. Under ordinary circumstances, if the probe is in the right position, it will pass along the nasal duct with a moderate pressure; undue resistance to a small probe indicates stricture of the duct or a false passage; in either case the pressure should be used cautiously. If the sound has passed easily, it should be left in position several minutes; in fact, it may remain one-half hour often to advantage. If the passage has been tight, the sound should be immediately withdrawn. The sounding of the passage should be repeated every 3 or 5 days, and the size of the sounds progressively increased. In some cases it is well for the patient to wear a leaden stilet constantly for several days. Theobald and others advocate the use of very large lacrimal sounds. A special probe-pointed knife has been devised for slitting strictures of the nasal duct. In treatment of the lacrimal passages we should resort to frequent syringing, various astringent and antiseptic preparations being used. Weak solutions of silver nitrate are of benefit in blennorrhea.

Recently there has been a reaction against promiscuous probing in lacrimal disease. The results are generally unsatisfactory and the case is often protracted. As a substitute there has lately been advised copious syringing with a fountain syringe attached to a hollow No. 4 Bowman's probe. The canaliculus need only be split halfway, and in some cases not at all. Boric acid and weak antiseptic solutions are used in the irrigations.

A simpler treatment of lacrimal obstruction, which dispenses with mutilation of the puncta and canaliculus and probing, consists in the following manipulations:

First empty the sac and canaliculi by dexterous pressure, and cleanse the eye and palpebral pockets of the unhealthy material. Then cant the patient's head back and to one side, or have him lie so that a teaspoonful of liquid will be held in the depression formed by the nose, orbital border, and superior maxilla. Fill this space with a weakly antiseptic solution. A good solution is composed, to the ounce of distilled water, of boric acid, 10 grains; common salt, 3 grains; chlorid of zinc, 1 grain—all deeply tinted with pyoktanin-blue, and doubly filtered after long standing. With the little finger again slowly empty the sac and canaliculi by pressure, and then, as slowly lessening the pressure, allow these spaces to refill, by suction and capillary attraction, with the solution under which the puncta are submerged. Again, in half a minute, empty the canaliculi and sac by pressure, but this time beginning the pressure from the canthus toward the nose and downward, so as to force the antiseptic solution downward into the duct. These alternate emptyings and refillings of the sac may be repeated several times and as often as desirable to meet the indications of the case. It will usually be found that the sac will soon become healthy, and that pressure upon it will not cause regurgitation of morbid material through the puncta.

A certain number of cases, however, will not yield to this treatment. There is too great stenosis or spasmodic contraction of the muscular sphincter of the punctum, etc., so that the cleansing solution cannot be forced into the sac and duct. In such cases it is well to insert one sharp point of the iris-scissors into the punctum, and snip it open about 1/8 of an inch, perpendicularly downward toward the conjunctival fold. This gives a larger opening for the indrawal of the solution.

Obliteration of the lacrimal sac is a questionable procedure. **The treatment of acute dacryocystitis** consists in voiding the pus, either through the canaliculus or by an incision through the skin. The fistula is treated like other fistulous passages, and will generally heal if the obstruction to the passage of tears is removed. Repeated irrigation, syringing, and probing are the important after-treatments of all these affections.

LACTATION.—See Breast, Infant Feeding, Milk (Mother's), New-born Infant.

LACTIC ACID.—A liquid composed of 75 percent by weight of absolute lactic acid, and 25 percent of water; nearly colorless, syrupy, odorless, of acid taste and reaction, freely miscible with water, alcohol and ether, but nearly insoluble in chloroform. It is produced by the lactic fermentation of sugar of milk or grape sugar, and is difficult to obtain pure. It enters into syrupus calcii lactophosphatis. Dose, 20 minims to 1 dram (average, 30 minims), well diluted.

It aids digestion and promotes the appetite, but in large doses causes flatulence and much epigastric pain. It dissolves false membranes and also calcium phosphate. Hypnotic properties have been ascribed to it.

Lactic acid is used with benefit in diabetes, atonic dyspepia, oxaluria, and in the lithic and phosphatic diatheses, when due to imperfect digestion and assimilation. As a solvent of false membrane in diphtheria it is unquestionably of great service, but painful. In chronic cystitis it arrests the ammoniacal decomposition in the urine. As the acid found in the shops is generally of poor quality, disappointment in its use may be expected. It has been used in tuberculous ulceration of the tongue: lactic acid, 80 parts; water, 20 parts, brushed daily over the ulcerated surface with a camel's-hair brush.

LACTOPHENIN.—A phenetidin derivative containing a lactic acid radicle instead of the acetic acid one of acetphenetidin (phenacetin). Its action is analgesic, antipyretic, and hypnotic; and it has been recommended as a substitute for phenacetin because of its greater solubility. Dose, 8 grains to begin with (for adults); maximum daily dose, 45 to 75 grains in wafers.

LACTUCARIUM (Lettuce).—The concrete milk-juice of *lactuca virosa.* It is partly soluble in alcohol and in ether, and yields a turbid mixture when triturated with water. Lactucarium is a mixture of several substances, the most important beng *lactocin,* which is thought to be the active principle. It occurs in white scales, is soluble in water, and is used as a sedative and hypnotic in doses of 1 to 5 grains. Lactucarium also contains three bitter principles, *lactucin, lactopicrin* and *lactucic acid;* also *lactucerin,* an inert, waxy substance, constituting nearly one-half of the drug. A minute quantity of a mydriatic alkaloid, believed to be *hyoscyamin,* has been found in the plant, but not in commercial lactucarium. Dose, 10 to 20 grains.

Lactucarium is feebly hypnotic, somewhat sedative and diuretic. It is supposed to act similarly to opium, but very feebly and without depressing after-symptoms. Its preparations are very uncertain in activity, and are chiefly used as placebos, to allay cough and quiet nervous irritability. The syrup is a good vehicle for expectorants and antispasmodics.

Tinctura L., 50 percent. Dose, 10 minims to 2 drams according to the activity of the drug. **Syrupus L.,** has of the tincture 10 percent. Dose, 1 to 8 drams.

LAGOPHTHALMOS.—A condition in which the eyeball is so extruded that the lids cannot be completely closed. The exposure of the eye following this condition is accompanied by the greatest danger to the cornea. Lagophthalmos may be due to staphyloma of the cornea, ocular or orbital tumor, exophthalmic goiter, or paralysis of the orbicularis muscle.

LA GRIPPE.—See INFLUENZA.

LAMBERT'S TREATMENT FOR NARCOTIC ADDICTION.—This treatment, originated by Mr. C. B. Towns of New York, has been described by Dr. Alexander Lambert, of the same city, and is best known under his name. Previous to its publication, the usual treatment had been to deprive the patient slowly or quickly of his narcotic on the theory that deprivation from a narcotic would soon wear off the desire for it. But deprivation instead of obliterating the craving, intensified it. A patient deprived of his morphin or alcohol counts the days or hours until he can return to his narcotic, and this longing for it and looking forward to it has been known to last for weeks and months. After this treatment has been correctly given the desire for the narcotic is gone, and although the patient may feel weak and relaxed, he does not feel the craving. This treatment will take a morphinist from his drug without undue suffering, and will put him in a position in which he may be built up and given a chance to be free from his drug. It will do the same for the man who takes cocain. It has also been successfully used for tobacco, and the habits of the coal-tar hypnotics such as veronal and trional. This treatment will put an alcoholic on his feet, make him absolutely sober, and with all desire for his alcohol gone. It will give the man who wishes to be helped a chance to be free from his habit. After a man has been freed from the desire for his drug—the after treatment is of the greatest importance. The patient should be made to realize that he is mentally just unpoised, and his nervous system cannot as a rule stand the strain of worry and work. He must be built up physically into as perfect a condition as circumstances will permit, and this will take usually three weeks or a month, or longer. If this is done, the physical condition will not tempt the mind back into the seductive taking of little nibbles at his drug, which to his mind don't count, but which in reality are the beginning again of all the old habit. It is useless to compromise; the man who has taken alcohol to excess, or morphin or cocain to excess, cannot again touch these things without great danger of relapse to all their excesses. The first drink will start up all the old desires with the same inevitable results. To the man who has indulged excessively, his nervous system and alcohol are chemically incompatible. The alcohol forms a poisonous combination with the brain cells which perverts the normal reaction of these cells. There is no question that it poisons the higher functions of the brain and perverts them. It is useless for him to ever hope to drink again in moderation. Many alcoholics have the faint hope back in their minds, against everything that is told them, everything they have experienced, and everything which their own judgment dictates, that some day they may be able to drink without going to excess. This *summum bonum* of their desires is always being sought for and never attained, and the self deception goes on; they are always trying to see if the first few drinks cannot be taken with impunity. This is one of the reasons why so many men revert. It is useless to endeavor to help a man who does not want to be helped. It is useless to waste time giving a treatment to take away the craving for narcotics to an individual who has no intention of trying to stop. The Lambert treatment is distinctly contraindicated in those who are not willing to help to stay sober. It is also contraindicated in pregnant women, as the very active cathartics may sometimes produce a miscarriage. The method of administering this treatment has been most recently described in the Journal of the American Medical Association of February 18, 1911, and is as follows:

The belladonna mixture of two parts 15 percent tincture of belladonna, and one part each of the fluidextracts of hyoscyamus and xanthoxylum, has proved itself an essential part of the treatment. When the 10 percent tincture of belladonna has been used, or when even a 12 percent tincture has been employed, the results obtained were not clear-cut, but left the patients with an indefinite nagging longing for their narcotic. It seems necessary to push this mixture to the physiologic tolerance of the belladonna. This tolerance, of course, varies with the individual, and some of the best results have been obtained with patients who could not tolerate as an hourly dose more than from 2 to 4 drops of this mixture, while others easily tolerated from 18 to 20. It would seem, judging from clinical results, that there are some properties in this mixture which are necessary to a successful carrying out of the treatment. The bottle containing this mixture must be kept well corked, and shaken before using. The method which Lambert pursues is as follows:

A patient addicted to morphin is given five compound cathartic pills and 5 grains of blue mass, and, six hours later, if these have not acted, they are followed by a saline; after three or four abundant movements of the bowels from these cathartics, the patient is given, in three divided doses at half-hour intervals, two-thirds of the total daily twenty-four-hour dose of morphin or opium to which he has been accustomed. Observe carefully after the second dose has been given, as the amount then equals four-ninths or nearly one-half the total twenty-four-hour dose. Some few patients cannot comfortably take more than this amount. At the same time with the morphin, 6 drops of the belladonna mixture are given in capsules. This belladonna mixture in doses of 6 drops (and by drops are not meant minims, but drops dropped from an ordinary medicine dropper, which is about half a minim dose) is given every hour for six hours. At the end of six hours the dosage is increased 2 drops. The belladonna mixture is continued every hour of the day and every hour of the night continuously throughout the treatment, increasing 2 drops every six hours until 16 drops are taken, when it is continued at this dosage; it is diminished or discontinued at any time if the patient shows belladonna symptoms such as dilated pupils, dry throat or redness of the skin, or the peculiar and incisive and insistent voice, and insistence on one or two ideas. It is begun again at reduced dosage after the above symptoms have subsided.

At the tenth hour after the initial dose of morphin is given, the patient is again given five compound cathartic pills, and 5 grains of blue mass. These should act in six or eight hours after they have been taken. If they do not act at this time some vigorous saline is given, and when they have acted thoroughly the second dose of morphin is given, which is usually about the eighteenth hour. This should be one-half the orginal dose; *i. e.*, one-third of the original twenty-four-hour daily dose. The belladonna mixture is still continued, and ten hours after the second dose of morphin has been given, that is about the twenty-eighth-hour, five compound cathartic pills are again given and 5 grains of blue mass, these again if necessary followed by a saline seven or eight hours later. At times when the C. C. pills are not acting well, or too slowly, five or six "B. B." pills are given from two to three hours after the C. C. pills. These "B. B." pills are the pilulæ catharticæ vegetabiles of the pharmacopeia with 1/10 grain of oleoresin of capsicum, 1/2 grain of ginger, and 1/25 minim of croton oil added to each pill. After these have thoroughly acted at about the thirty-sixth hour, the third dose of morphin is given, which is one-sixth of the original dose. This is usually the last dose of morphin that is necessary. Again, ten hours after this third dose of morphin, *i. e.*, the forty-sixth hour, the five C. C. pills and 5 grains of blue mass are again given, followed in seven or eight hours afterward by a saline, and one expects at this time to see the bilious green stool appear. When this appears, after the bowels have moved thoroughly, ten or twelve hours after the third dose of morphin, about the fifty-sixth hour, two ounces of castor oil are given to clear out thoroughly the intestinal tract. During this last period when the bowels are moving from the C. C. pills and before the oil is given, the patients have their most uncomfortable time. Their nervousness and discomfort can be controlled usually by codein, which can be given hypodermically in 5 grain doses and repeated if necessary, or some form of the valerianates may help them. About the thirtieth hour these patients should be stimulated with strychnin or digitalis, or both. After they are off their drug, the tonics which do them the most good are those which contain some form of phosphorus and arsenic; and here a warning must be given as to the danger of these patients overeating, and thus bringing back all their withdrawal symptoms due to the disturbance of digestion. They have been in the habit of referring all uncomfortable feelings to those of the withdrawal symptoms of morphin, and digestive disturbances feign these withdrawal symptoms. Sometimes about the thirty-sixth hour the stools become clay-colored. Some form of prepared ox-gall is most effective to stimulate further biliary secretion given in small doses every hour for five or six doses.

In treating an alcoholic, the belladonna mixture and the five C. C. pills and 5 grains of blue mass are given simultaneously at the first dose. The belladonna mixture is continued every hour of the day and every hour of the night the same as with the morphin patients, and twelve hours after the initial dose patients are again given from three to five C. C. pills, and at the twenty-fourth hour after the initial dose, they are again given the cathartics followed by salines if necessary, and again at the thirty-sixth hour. After these cathartics the bilious stools will appear, and by the forty-fourth or forty-fifth hour the castor oil is given. Sometimes it is necessary to carry on the treatment over another period, and the C. C. pills and blue mass are again given at the forty-eighth hour, which would bring the end of the treatment about the sixtieth hour.

Elderly or very nervous patients who have been on a prolonged debauch are tapered off with 2 ounces of whisky for four or five doses through the first twenty-four hours. If these patients are excessively nervous it is necessary also to see that they sleep, and the mixture of chloral hydrate, 20 grains; morphin, 1/8 grain; tincture of hyoscyamus 1/2 dram; ginger, 10 minims; and capsicum 5 minims; water 1/2 ounce; which was recommended before is the best hypnotic for them. These patients should also have cardiac stimulants such as strychnin and digitalis after the first twenty-four hours, sooner if they are weak. If the patient has an alcoholic gastritis and cannot retain medicine, it is wise to give him 5 grains of Tully's powder (pulvis morphinæ compositus) with 5 grains of sodium bicarbonate about every two hours for two or three doses, as this seems to be the most effective method of allaying the vomiting of an alcoholic gastritis.

The cocainist can be treated like the alcoholic, except that no cocain is given at any time, and strychnin or some such stimulant must be given from the beginning of the treatment.

The lasting effects of this treatment are of course greatly influenced by the environment in which the patient must live after he has had the treatment. As was said before, if he be in as fine physical condition as is possible, he stands the best chance of being able to resist. Except in the elderly, and those in whom there is danger from cardiac degeneration physical exercise is the very best after treatment. They should not be treated with a rest cure, but should be built up by physical exertion. As soon as they are in good physical trim they will do better if the responsibility of some occupation is given them, rather than distrust and idleness. It is a very noticeable feature in treating these patients, especially the alcoholics, that those who are addicted to a cigarette habit are much more prone to relapse than those who do not smoke at all, or even than those who smoke cigars or a pipe. It is the constant poisoning by an incessant accumulation of small doses of tobacco poison, which finally amounts to a chronic tobacco poisoning. This wears on their nerves, and their nerves must be quieted by some narcotic and they turn to the one to which they are most accustomed and moving in the line of least resistance drop back into their old habits. If a man who drinks to excess can be treated at the same time for his cigarette habit, it increases the probability of his remaining abstinent. This treatment must not be considered as a cure-all and a regenerator of the weak minded and congenitally unfit members of the human race, but it will give those who desire to break away from narcotic addiction a chance to do so, and a chance to go on in life successfully, where they might otherwise fail.

LAMINARIA (Sea-tangle).—A seaweed, *Laminaria digitata*, found upon the shores of Great Britain. It has a stem from 6 to 15 feet in length, and about 1 inch to 1 1/2 inches in diameter at its largest part. The stem shrinks to a marked degree in drying. The dried pieces, when again moistened, quickly regain their natural size. This property makes laminaria valuable for the manufacture of tents and bougies. The plant is one of the sources of iodin, which it contains in large proportion. When burned, it produces a superior, fine-grained charcoal. See TENT.

LAMINECTOMY.—See SPINE (Injuries).

LANDRY'S PARALYSIS.—See PARALYSIS (Acute Ascending).

LANOLIN (Adeps lanæ hydrosus).—The purified fat of the wool of sheep, mixed with not more than 30 percent of water. A yellowish-white, ointment-like mass of faint, peculiar odor, insoluble in water, but miscible with twice its weight thereof. It is a cholesterin fat, differing from other fatty substances chiefly in resisting saponification and the action of water, and having no tendency to become rancid. It readily passes through the integument, carrying with it any medicament with which it is charged. It is a neutral base, and not likely to decompose any substance. It is peculiarly useful in chronic skin-disease where there is infiltration. It is inferior to lard, vaselin, or cold cream when a simple protective action alone is desired.

LAPAROTOMY.—See ABDOMINAL SECTION.

LAPPA (Burdock).—The dried root of *Arctium Lappa*, and of other species of *Arctium*. It contains a bitter principle, traces of a volatile oil, also inulin, resin, tannin, mucilage, sugar, etc. Dose, 20 to 45 grains.

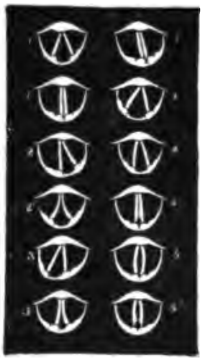
Lappa promotes all the secretions and is considered aperient, diuretic and diaphoretic, without irritating qualities. In decoction it has been a popular domestic remedy for many morbid conditions, especially rheumatism, gout, pulmonary catarrhs, and chronic cutaneous affections. It has been used as an alterative in constitutional diseases, as syphilis and scrofula, also as an external application to swellings, hemorrhoids and chronic sores.

Fluidextractum Lappæ, made with diluted alcohol. Dose, 20 to 45 minims.

LARD (Adeps).—The prepared internal fat of the abdomen of the hog, purified by washing, melting and straining. It occurs as a soft, white, unctuous solid, of bland taste and neutral reaction, entirely soluble in ether, benzin, and bisulphid of carbon; composed of 38 percent of stearin and margarin, and 62 percent of olein. Lard forms 50 percent of ceratum, and 80 percent of unguentum, and enters into the composition of several of the official cerates.

Preparations.—**Adeps benzoinatus**, *benzoinated lard*, has 2 percent of benzoin in powder, incorporated by stirring. **Oleum adipis**, *lard oil*, is a fixed oil expressed from lard at a low temperature.

LARGIN.—A silver-albumin compound, which in the air-dried condition contains 11 percent of silver. It forms a gray powder, which is soluble in 10 parts of water. Largin is a powerful bactericide and astringent, like silver nitrate, but is nonirritant, and is not precipitated by sodium chlorid or albumin. It is chiefly used in gonorrhea in 1/4 to 1 1/2 percent solution.



VOCAL CORDS (DIAGRAMMATIC MIRROR PICTURE). 1. Normal position in breathing and phonation respectively. 2. Adductor paralysis (left); 2'. bilateral adductor paralysis. Both in phonation. 3. Unilateral abductor (left) and 3'. Bilateral abductor paralysis both during breathing. 4. Left recurrent paralysis phonation. 4'. Same in respiration. 4''. Recurrent bilateral in both respiration and phonation. 5. Arytenoid paralysis phonation. 5', Thyroarytenoid paralysis. phonation. 5''. Arytenoid and thyroarytenoid paralysis.—(*Greene.*)

LARYNGEAL MUSCLES, PARALYSIS. **Etiology.**—Central nervous lesions, as bulbar paralysis; peripheral nervous lesions, affecting the recurrent laryngeal nerve (such as aortic aneurysm, tumor of mediastinum, diphtheritic paralysis); local lesions of the vocal cords (such as ulceration due to syphilis, or tuberculosis); and hysteria.

The nerves involved are the superior laryngeal and the recurrent laryngeal (both branches of the pneumograstric nerve).

The following oft-quoted table from Gowers shows the symptoms, laryngoscopic picture, and lesions.

Treatment, is that of the cause; electricity and strychnin have also been employed.

SYMPTOMS.	SIGNS.	LESION.
(*a*) No voice; no cough; stridor only on deep inspiration.	Both cords moderately abducted and motionless.	Total bilateral palsy.
(*b*) Voice low-pitched and hoarse, no cough; stridor absent or slight on breathing.	One cord moderately abducted and motionless, the other moving freely and even beyond the middle line in phonation.	Total unilateral palsy.
(*c*) Voice little changed; cough normal; inspiration difficult and long, with loud stridor.	Both cords near together, and during inspiration not separated, but even drawn nearer together.	Total abductor palsy.
(*d*) Symptoms inconclusive; little affection of the voice or cough.	One cord near the middle line, not moving during inspiration; the other normal.	Unilateral abductor palsy.
(*e*) No voice; perfect cough; no stridor or dyspnea.	Cord normal in position and moving normally in respiration, but not brought together on an attempt at phonation.	Adductor palsy.

LARYNGISMUS STRIDULUS.—A peculiar form of laryngo-respiratory spasm, occurring almost exclusively in rickety children. There is no lesion of the larynx, it being usually a pure neurosis. The characteristic feature of the attack is a sudden "holding of the breath" for a few seconds; the glottis is then burst open, the air rushing in with a stridulous sound. In a severe attack not only the glottis, but the epiglottis, is closed, and the respiratory muscles are in a state of spasm. The exciting cause is most commonly some emotional disturbance, while dentition, irritation of the larynx or pharynx, nasal adenoids, or constipation may act as exciting causes.

The following table gives the chief points of diagnosis:

LARYNGISMUS (SPASM OF THE GLOTTIS).	SPASMODIC LARYNGITIS.	MEMBRANOUS CROUP.
Occurs in rickety children 18 months of age.	Rarely occurs under 2 years of age; commonest 2 to 7 years.	Occurs at all ages during childhood.
No fever, no coryza and no laryngeal catarrh.	Slight fever, mostly coryza and laryngeal catarrh.	Variable amount of fever and perhaps some diphtheria of fauces.
Occurs at any period of the 24 hours, and often many times.	Attack occurs at night.	Mostly worse at night.
No cough; inspirations are stridulous.	Metallic cough, stridulous respirations, variable dyspnea.	Metallic cough, stridulous respiration, progressive dyspnea.
Contraction of the limbs or general convulsions not uncommon.	Convulsions rare.	Convulsions rare.
The attack lasts a few seconds and then recurs frequently.	Attack passes off in the course of an hour or two.	Becomes steadily worse, though variations occur in its progress.
Occasionally fatal...	Rarely fatal.....	Very often fatal.

Treatment.—During the spasmodic stage, while the breath is being held, attempts to excite the inspiratory center reflexly must be made. Cold water may be dashed in the face, the back may be patted, or a vigorous shake be given. Fanning the face vigorously during an attack is also useful. Hooking back the epiglottis with the forefinger is usually followed by an inspiration. A catheter may be passed into the larynx, or intubation performed, while quick tracheotomy is indicated if other means are not speedily followed by relief. The most useful medicines to check attacks are chloral, bromids, and minute doses of morphin. Potassium (or sodium) bromid, with chloral, may be given to an infant of 6 months, and repeated every 6 hours.

℞.		
℞.	Potassium bromid,	ʒ ij
	Chloral,	gr. xxxij
	Peppermint water,	℥ ij.

Teaspoonful every half hour.

The diet and surroundings are most important. Fresh air is imperative; and a steam tent and close, hot room are the worst possible things. A change to the seaside works wonders, and medicines which assist and regulate the bowels, such as extract of malt, rhubard and soda, acids and pepsin, and cod-liver oil, when it can be digested, are indicated.

LARYNGITIS, ACUTE.—Acute catarrhal laryngitis; mucous laryngitis.

Acute inflammation of the mucus membrane lining the larynx.

Etiology.—(1) Sudden changes in the atmosphere; (2) exposure to the cold and wet; (3) immoderate use of voice; (4) inhalation of dust or chemicals; (5) traumatism; (6) certain diseases act as predisposing causes, such as tuberculosis, rheumatic diathesis.

Pathology.—The mucous membrane is red and highly congested, the swollen capillaries being of larger volume, and traverse the surface of the membrane in all directions. Large quantities of mucus are secreted, and form a coating over the vocal bands. In some cases the serous material is retained within the cellular tissue, causing occlusion of the glottis (edema of the larynx). The latter condition is more common in tuberculosis or syphilis.

Symptoms.—There are, commonly, hoarseness, cough, expectoration of a viscid secretion, dryness of throat, and pain on deglutition. In children the respiration is frequently embarrassed, and paroxysms of croup may occur. Physical examination reveals a reddened condition of the mucous membrane lining the organ, and also affecting the vocal bands, which lose their characteristic shining appearance.

Diagnosis is determined by the subjective and objective symptoms.

Prognosis is favorable.

General Treatment.—Calomel should be given in fractional doses (1/4 of a grain), followed by a saline purge. The room should be at an equable temperature, not lower than 65° F.

℞.	Tincture of aconite,	♏ xxx
	Tincture of belladonna,	♏ xxx
	Glycerin,	ʒ ij
	Solution of potassium citrate, enough to make	℥ ij.

Two teaspoonfuls every 3 hours.

Hot foot-baths taken at bedtime are of great benefit. The water should be as hot as can be borne, and applied by means of a towel as high up as the knees. From 10 to 15 minutes may be well spent in this manner. If necessary, it may be repeated again during the night, and for several successive nights. Diaphoresis may be encouraged by the use of hot drinks, with 5-grain doses of quinin and a Dover's powder. The diet at all times should be light and nourishing. Under no circumstances should constipation be allowed to exist.

Diuretics are also advisable; the solution of potassium citrate is particularly serviceable. It may be combined with 2-drop or 4-drop doses of tincture of aconite.

Local Treatment.—Small pieces of ice may be allowed slowly to dissolve in the mouth; externally, cold cloths. Leiter's coil or rubber tubing, through which cold water is allowed to run, may be applied.

Sedative inhalations are valuable:

℞.	Menthol,	gr. ij
	Chloroform,	ʒ ss
	Compound tincture of benzoin, enough to make	℥ ij.

Two teaspoonfuls to a pint of hot water, and inhale every two hours.

For the first 2 or 3 days the throat may be swabbed out once daily with glycerite of tannin or boroglycerid.

Acute laryngitis in children is best relieved by the administration of syrup of ipecac (1/2 of a dram) every 15 minutes until vomiting occurs. Externally, the throat may be thoroughly lubricated with benzoinated lard, containing a small amount of oil of mustard. The parts may be covered with hot flannel cloths, frequently repeated. If there is a tendency to recur, the throat may be swabbed with glycerite of tannin.

LARYNGITIS, CHRONIC. Varieties.—Simple chronic catarrhal laryngitis; (2) tubercular laryngitis; (3) syphilitic laryngitis.

Simple Chronic Catarrhal Laryngitis.

Synonym.—Chronic laryngeal catarrh.

The etiology is the same as acute laryngitis. It may follow acute attacks.

Pathology.—Cellular infiltration and hypertrophy of the mucous membrane, with permanent dilatation of the blood-vessels, is the distinct lesion. The glandular structure becomes involved, forming slight elevations (granulations), giving rise to what is termed follicular laryngitis. Generally the surface is red and swollen, and covered with thick mucus. Superficial erosions may occur. The vocal bands may contain small nodules.

Symptoms.—Tickling in the throat, hoarseness, persistent cough, and expectoration of thick, tenacious, whitish mucus are the most common symptoms. Physical examination reveals congestion of the larynx, with small granulations in certain portions of the mucous membrane. The vocal bands are usually reddened, frequently unilateral, or the cartilaginous portion alone may be affected.

Prognosis is guardedly favorable under prolonged treatment.

General Treatment.—Correct the indigestion, constipation, and restrict the use of tobacco and alcoholic drinks. Tonics, such as the syrup of hypophosphites with iron and strychnin, are valuable. Turkish baths are of benefit.

Local Treatment.—Erosions or enlarged follicles, after being cocainized, should be removed by means of molded silver nitrate or the galvanocautery. Stimulating inhalations are of service.

℞.	Eucalyptol,	gr. iij
	Spirit of camphor,	ʒ iv
	Compound tincture of benzoin, enough to make	℥ ij.

Two teaspoonfuls to a pint of hot water. Inhale on rising and at bedtime.

After the morning inhalation it is best for the patient to remain indoors for an hour or two. Local applications of a solution of silver nitrate (10 to 20 grains to the ounce) may be applied twice a week. Glycerite of tannin, or boroglycerid (50 percent), may be substituted for the silver nitrate. Cleanse the throat at intervals by means of alkaline solutions, used in the form of a spray. Solutions made from any of the antiseptic nasal-douche tablets may be employed for this purpose. See RHINITIS (Chronic). Guaiac has been recommended. It is best administered in the form of a lozenge.

℞.	
Guaiac,	ʒ ij
Oil of cloves,	♏ ij
Oil of lemon,	♏ v
Powdered acacia,	ʒ ss
Powdered sugar,	ʒ j

Confection of rose, enough to make 30 lozenges.

Allow one to dissolve in the mouth every 4 hours.

Tuberculous Laryngitis.

This is usually secondary to pulmonary tuberculosis.

Symptoms.—Hoarseness, pain on deglutition, distressing cough, hemoptysis, and frequent attacks of aphonia.

Physical examination reveals a marked paleness of the mucous membrane of the larynx and vocal cords, ulceration, and distinct hypertrophy (excrescences) of the glandular structure in localized areas. Caries and necrosis may be present. The ulcers are multiple in character and have a tendency to coalesce without much tendency to penetrate deeply.

Tuberculous laryngitis and syphilitic laryngitis may be differentiated as follows:

TUBERCULOUS LARYNGITIS	SYPHILITIC LARYNGITIS
Pain severe on deglutition.	Usually slight.
Ulcerates slowly.	Rapidly.
Usually first appears as small spots or nodules which are rapidly followed by great edema.	Is rarely seen in stage of induration, the first evidence being a clear-cut, deep ulcer.
Ulcers extend laterally, but not deeply.	Extend deeply, often involving cartilage.
Mucous membrane is usually pale.	Hyperemic, injected.
Health impaired previous to laryngeal involvement.	Unimpaired.
Previous or coincident pulmonary trouble common.	Frequently evidence of syphilitic disease in other tissues.
Iodids have no influence.	Readily improves under iodids.

Complication.—Edema of the larynx is very common.

Prognosis.—See TUBERCULOSIS.

General Treatment.—See TUBERCULOSIS.

Local Treatment.—Cleanse the parts once or twice a week with an alkaline spray, and subsequently dust over with aristol or iodoform. If the pain is intense, touch the ulcers with a solution of cocain (10 percent). Menthol may also be used for the same purpose.

To be inhaled:

℞.	
Menthol,	gr. iij
Creosote (beechwood),	♏ xvj
Compound tincture of benzoin,	℥ ij.

Two teaspoonfuls to a pint of hot water. Inhale at bedtime.

Weak solutions of menthol in albolene used in a nebulizer give good results.

More profound and prolonged anesthesia may, however, be produced by the application of a 20 percent solution of quinin and urea hydrochlorid (*q. v.*); which has recently been highly praised.

Electric cataphoresis with guaiacol or oxychlorid of copper has proved of value. Submucous and intratrachial injections of guaiacol, 20 percent, are sometimes efficacious.

Edema of the larynx frequently occurs, and tracheotomy is occasionally advisable.

Syphilitic Laryngitis.

Symptoms.—There is peristent huskiness of voice. The cough is less troublesome than in the tuberculous form, and pain is not great or may be entirely absent.

Physical Examination.—The larynx is ulcerated, the vocal cords congested, and mucous patches may appear on the tip of the epiglottis or on the ventricular bands. The latter are described by Gottstein as being "round or elongated grayish-white spots of thickened epithelium, slightly raised upon the congested tissue which surrounds them, and are either sharply circumscribed or shade gradually off into it." The secretion is scanty and very tenacious.

Complication.—Edema of the larynx is very common.

General Treatment.—See SYPHILIS.

Locally, the ulcers may be touched with the galvanocautery, a solution of zinc chlorid (30 grains to 1 ounce), or with a crystal of copper sulphate or silver nitrate. Stimulating inhalations may be used.

Should edema of larynx occur, tracheotomy may be necessary.

LARYNGITIS, EDEMATOUS (Edema of the Glottis).—An acute inflammation of the mucous membrane of the larynx and that about the glottis, with an infiltration of the areolar tissues by a serous, seropurulent, or purulent fluid; it is characterized by obstructed or stridulous breathing and dysphonia or aphonia.

Etiology.—It may be the result of acute laryngitis; abscess in or about the throat or tonsils; erysipelas of the face; scarlatina; small-pox; Bright's disease; syphilis of the larynx. It is rare in children, except when due to scalds.

Pathologic Anatomy.—There is infiltration of the loose connective tissue of the aryepiglottic folds, the glossoepiglottic ligament, the base of the epiglottis, and the interarytenoid space. If the true vocal bands are inflamed, their color changes, and instead of appearing white, glistening, and brilliant, they are dull, grayish-red, or violet-red in patches. If the swelling is the result of purulent infiltration, the parts affected present a deeply congested color, with here and there spots of a yellowish hue. Serous infiltration, sufficient to cause fatal edema, disappears with death, leaving but slight traces to account for the formidable symptoms.

Symptoms.—The onset is much the same as a simple catarrhal laryngitis with a gradually increasing impediment to the respiration. The patient experiences the sensation of a foreign body in the throat, and, after a short time, a difficulty of breathing, which ultimately threatens suffocation. The deglutition is rendered difficult owing to the swelling of the epiglottis. The voice, at first muffled, gradually becomes weaker and weaker, until finally it is almost extinct. The cough at first is dry and harsh, but as the infiltration increases it becomes stridulous and suppressed; there is no expectoration except that, after great effort to clear the throat, a little frothy mucus is raised. The difficulty of respiration, as the disease progresses, becomes greater and greater, and the paroxysms of impending suffocation more frequent. The inspiration is accompanied by a whistling sound characteristic of the narrow condition of the glottis; the patient sits up in bed, his mouth open, gasping for breath, his eyes protruding, the whole body trembling with intense convulsive movements; after a time a general cyanosis commences, the face assuming a bluish hue, all these symptoms continuing for a few moments, when slight relief occurs, to be again followed by another paroxysm, in one of which, if nature or art does not afford prompt relief, death occurs from asphyxia. A physical examination of the parts may be made by gently passing the finger into the throat, when the epiglottis may be felt very much thickened, and the aryepiglottic folds may have attained such tumefaction as to convey to the finger an impression similar to that which is given by touching the tonsils.

Laryngoscopic Appearance.—The mucous membrane has a bright-red appearance. The epiglottis has the appearance of a semitransparent, roll-like body, or it is often merely erect and tense. It is this condition of the epiglottis which explains the pain and difficulty in deglutition. Rarely the vocal bands are infiltrated.

Diagnosis.—Any disease which gives rise to dyspnea may simulate edematous laryngitis, but the history of the case, together with a laryngoscopic examination, will generally furnish conclusive evidence as to the real nature of the malady.

Prognosis is, as a rule, unfavorable. If early and vigorous treatment is instituted, recovery is possible; but without it death is the inevitable result, the patient dying asphyxiated. Even when local measures have removed the obstruction to free respiration, the patient is very likely to perish subsequently from exhaustion or blood-poisoning, or from pneumonia or other lung complication. The duration of infiltration of the larynx varies from a few hours to several days.

Treatment.—Prompt local treatment must be adopted in order to remove the laryngeal obstruction. A blister or leeches placed over the sides of the larynx in mild cases may effect so much reduction in the edema as to free the patient from danger.

If the infiltration has already occurred, and is slight in amount, scarification, guiding the instrument by the index-finger of the opposite hand, may afford relief, or the hypodermic injection of pilocarpin, 1/3 of a grain, repeated, may lessen the swelling.

The persistent use of small pellets of ice, swallowed or held far back in the mouth until dissolved, early in the attack and the application of ice to the neck; the administration of saline laxatives; the inhalation or spray of alum, adrenalin, or a strong solution of tannic acid; and the application, as near the seat of the disease as possible, of Monsel's solution, full or half strength, may be effective. Mackenzie says the patient should be kept constantly under the influence of potassium bromid.

If these means fail, tracheotomy or intubation is indicated; in those cases of sudden and rapid infiltration of the glottis or larynx occurring in Bright's disease, erysipelas, scarlatina, or syphilis of the larynx, and especially the former and the latter, tracheotomy or intubation should be performed at once.

In all cases of infiltration of the larynx stimulants should be boldly administered by the rectum, if stomachic administration is impossible. If the infiltration is composed of pus, quinin sulphate, 5 grains every 4 hours, and stimulants are indicated. See LARYNGITIS, TRACHEOTOMY, INTUBATION.

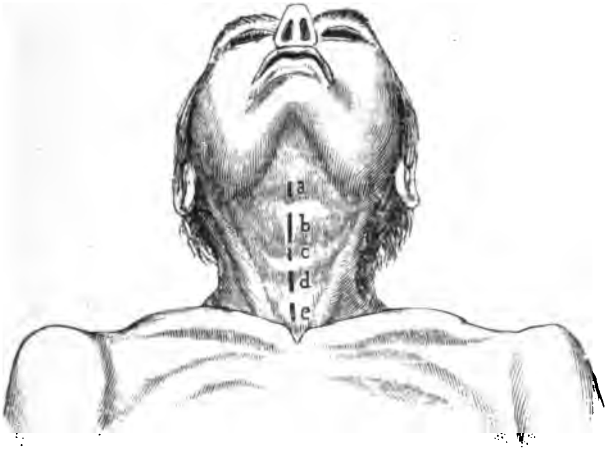
LARNYGOSCOPE.—See LARYNX (Examination).

LARYNGOTOMY. Indications.—The operation of laryngotomy is now rarely performed by laryngologists, because of their skill in operating within the larynx through the mouth; yet with surgeons less skilled in laryngology, and, perhaps, more efficient in general operating, laryngotomy continues in favor. It must be remembered, however, that it is a serious operation, and especially dangerous in young children and the aged. It is indicated for the removal of neoplasms and foreign bodies in the larynx, provided there is danger to life from suffocation or dysphagia, and when they cannot be removed through the mouth; also, in some instances, for the relief of stenosis resulting from diphtheria, when other measures fail. In cases in which laryngeal tumors are very large or very numerous, or, when single, are attached in places difficult to reach, laryngotomy is probably easier than intralaryngeal operation, and sometimes it may be safer and more complete.

Impacted jagged foreign bodies often demand laryngotomy, and others usually require tracheotomy. In any case the operation to be preferred, provided the operator is competent, should only be decided upon after an accurate diagnosis, unless suffocation is imminent, and then tracheotomy should be done.

The history and symptoms can seldom be relied upon in making an accurate diagnosis of surgical affection of the larynx. In supposed cases of foreign bodies in the larynx due attention must be given to the statements and sensations of the patient; yet they are often very misleading, so that inspection is necessary in most cases. Laryngoscopy is difficult, and sometimes impossible, in nervous children and in some adults. When the throat is very irritable, the sensitiveness may generally be relieved by the use of a cocain spray. But in young children in order to inspect the larynx one will often be obliged to give an anesthetic and then employ Kerstein's autoscope. Even this will fail to reveal the parts in some cases, and then we must rely upon the symptoms and history for our diagnosis.

The symptoms of foreign bodies in the larynx vary greatly with the position, size, and shape of the object, ranging from a slight irritation, and including paroxysmal cough, dyspnea, dysphagia, and hemorrhage, to clonic spasms of the glottis and speedy death. The usual symptoms of a tumor in the larynx—varying, of course, with its size and shape—are cough, dyspnea, dysphonia or aphonia, and dysphagia. There is also slight pain in some cases.

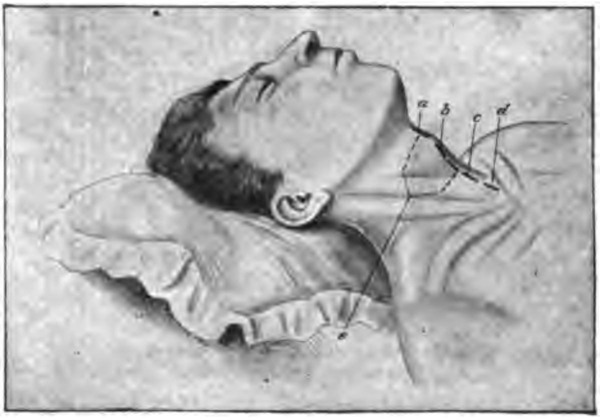


Situation for Incision in the Middle Line of the Neck.
a. Subhyoid pharyngotomy. b. Thyrotomy. c. Laryngotomy. d. Tracheotomy above isthmus. e. Tracheotomy below isthmus. The lines only show the relative situation of the incisions, not their correct length.—(*Spencer and Gask.*)

Operation.—Laryngotomy includes suprathyroid laryngotomy, thyrotomy, and infrathyroid laryngotomy.

Suprathyroid laryngotomy is performed by making a transverse incision through the superficial structures and the thyroid membrane. This incision gives but a limited exposure of the cavity of the larynx, and the operation is seldom employed, as by it no more can be accomplished than through the mouth.

The infrathyroid method is seldom resorted to unless combined with division of some of the upper rings of the trachea.



Laryngeal Incision.
a. Median subhyoid pharyngotomy. b. Thyrotomy, and, point below, laryngotomy. c. High tracheotomy. d. Low tracheotomy. e. The interrupted lines mark the incisions in laryngectomy.—(*Spencer and Gask.*)

Thyrotomy consists of the division of the thyroid cartilage in the median line, and is the operation commonly referred to as laryngotomy.

If there is great embarrassment of respiration or if much bleeding is feared from the operation within the larynx, a preliminary tracheotomy should be performed and a proper tube inserted and left in place. This insures free respiration and allows the upper part of the trachea or lower part of the larynx to be packed with gauze in case troublesome hemorrhage is encountered within the larynx. Several days, or, better, one or more weeks, should generally elapse before the more serious operation of thyrotomy is undertaken, though sometimes it is best to do both operations at the same time. In the interim the surgeon may endeavor from time to time to remove the growth or foreign bodies by endolaryngeal means or through the tracheal opening; or success may possibly be attained by the aid of Kerstein's autoscope.

For thyrotomy the patient should be anesthetized, and if tracheotomy has been previously performed, a rubber tube may be attached to the cannula within the trachea and the anesthetic administered through the tube, out of the operator's way. The patient should be in the dorsal recumbent position, with the head hanging over the end of the table, supported by an assistant or by the knees of the operator.

An incision is made exactly in the median line, from the hyoid bone to just below the cricoid cartilage, dividing everything down to the thyroid cartilage. The soft parts should be retracted and all hemorrhage arrested. The thyroid cartilage now remains to be divided. In children this can easily be done with a strong knife or scissors. In adults if ossification has taken place, a small circular saw revolved by a motor, a convex saw, or bone-forceps will be found satisfactory. Care must be taken to cut exactly in the median line, and thus avoid the vocal bands, which are attached on either side. It is advantageous to leave a little of the upper part of the thyroid cartilage intact, in order to avoid displacement of the vocal cords in suturing the edges of the wound. The greatest difficulties of the operation begin when the larynx is opened. Violent reflex action is set up from the introduction of the knife or blood into the larynx, which rises and falls rapidly and spasmodically. A sharp-pointed knife is therefore dangerous at this stage of the operation. When this reflex action interferes greatly with the progress of the operation, it may be checked, in a measure, at least, by spraying a 10 percent solution of cocain on the laryngeal mucous membrane. Hemorrhage is seldom marked, save in cancerous growths. Compression is usually sufficient to arrest what bleeding there is.

If operating for a tumor, the larynx may now be tamponed below the growth, as suggested for the prevention of the entrance of blood into the trachea.

The divided cartilages having been retracted, the growth or foreign body is removed. To remove neoplasms several differently shaped slender forceps, cutting forceps, sharp spoons, a snare, porte-caustique, and pointed cautery electrodes should be at hand. These must be used with great care, so as to preserve as much of the mucous membrane of the part as is compatible with thorough removal of the tumor. The base of the tumor should be cauterized with the galvanocautery or with solid nitrate of silver. Mackenzie prefers the latter, believing this practice less likely to be followed by laryngitis. The foreign body or tumor having been removed, the larynx should be gently sponged, to remove all foreign substance, and the divided cartilages carefully approximated and sutured, preferably with silver wire.

If tracheotomy has been performed, the tube should be left in the trachea until all danger of edematous laryngitis is past.

Removal of a papilloma is not infrequently followed by recurrence, but the operation may be repeated with a good hope of permanent cure. Malignant growths are, of course, liable to return, and the operation for their removal is useless, except when the growth is very small and distinctly circumscribed. See NECK (Injuries).

LARYNX, EXAMINATION.—The larynx is the organ of voice placed at the upper part of the air-passage. It is situated between the trachea and base of the tongue, at the upper and anterior region of the neck. On each side of it lie the great vessels of the neck; behind it forms part of the boundary of the pharynx, and is covered by the mucous membrane lining that cavity (Gray).

Physical Examination of the Larynx (Laryngoscopy).—For this is needed (1) sunlight or light from a student-lamp or an Argand or Welsbach gas-burner; (2) a head-mirror with an aperture in center; (3) two sizes of laryngeal mirrors; (4) a tongue-depressor; (5) a throat applicator; (6) a solution of cocain (5 percent or 10 percent).

The patient is seated facing the examiner, with the light behind or on either side of the head and on a level with the eye of the operator. After anesthetizing the posterior vault of the pharynx and soft palate with a solution of cocain (5 percent), the tongue is then grasped firmly between the folds of a napkin and withdrawn a sufficient distance so as to expose the vault of the pharynx, and the light is then reflected by means of the head-mirror. It is essential that the operator should always look through the central opening of the mirror, instead of from above or below.

The laryngoscopic mirror is then slightly heated (to prevent the image from becoming cloudy from the moisture given off during respiration), and slowly introduced until the posterior vault of the pharynx is reached. Care should be exercised not to touch any portion of the vault of the pharynx, tongue, or of soft palate not anesthetized, as it would cause retching, and often vomiting. The patient is then directed to slightly tilt the head backward and to phonate "ā" or "ee"

The first examination is often unsatisfactory, from the fact that the fear of the patient is aroused.

LARYNX, FOREIGN BODIES.—It not infrequently happens that children, place various articles in their mouth, and then by aspiration draw them into the trachea, instead of swallowing them, as was purposed. Such accidents are not infrequent with beans, peas, cherry-pits, almonds, candies, pennies, tacks, corks, etc.

The symptoms are violent coughing and suffocation, with cyanosis, attending the entrance of a foreign body into the larynx, and if it remains, an irritating cough persists with subsequent inflammation and ulceration of the trachea. Should the substance be carried deeper, we may be able to perceive its irritating motion as an audible gurgling sound, to and fro with each respiration. Or if it is lodged fast, as might happen with a sharp bit of bone, it produces localized ulceration, indicated by a cough attended with bloody or purulent sputum. Should the body be drawn still lower down into the smaller bronchioles, it may lead either to atelecetasis of that portion of the lung or to pneumonia.

Some of these foreign bodies, as needles, may migrate to other parts of the body, or they may result in abscesses, or may, more rarely, become encapsulated. Small, soft bodies, like bits of meat, may be thrown out by violent coughing or, if soluble, like candy, may be dissolved.

The prognosis is generally unfavorable if the foreign body has passed within the vocal bands or if the body is too large to be coughed out or dissolved. An insoluble foreign body inspired into one of the lesser bronchioles leads almost inevitably to death, as there is no operative or medicinal measure that can be safely used for its removal.

Treatment.—If the foreign body lies above the vocal bands, its extraction should be attempted as speedily as possible, with the aid of the appropriate instruments, or, if these are not at hand, by holding the child by its heels, head downward, and encouraging coughing by slapping its back or tickling its fauces. When the offending substance has gone deeper, we must resort, first, to forcible expiration following long-drawn inspirations (forced coughing) and emetics, the promptest of which is apomorphin (1/12 of a grain) or turpeth mineral (1 grain). Tracheotomy is called for when the object can be localized, and this operation is usually successful. See LARYNGOTOMY, TRACHEOTOMY.

LARYNX, TUMORS.—The most frequent benign tumors observed are first, papillomata, second, fibromata. They should be removed under local anesthesia by the intralaryngeal method if possible, the laryngeal forceps, the cutting forceps, the cold wire or galvanocautery snare being used. In children, and for large growths tracheotomy may be demanded.

Malignant growths are usually epitheliomata. Rarely sarcoma occurs. In the case of a sarcoma the preliminary tracheotomy, which is desirable in every instance, generally reveals the necessity of a complete laryngectomy. Epithelioma usually originates in a vocal cord, in old or middle aged men and is of slow development. There may be a history of chronic inflammation or of overuse of the voice. The first symptom is hoarseness. Microscopic examination of a piece of the growth may not be feasible. In some cases, indeed, there is danger of metastasis and stimulation of the growth resulting from removal of a piece of tissue, and a negative report is often misleading. Tuberculosis and syphilis may be eliminated by the tuberculin test and large doses of potassium iodid. One or the other of these diseases, however, may coexist with the epithelioma.

Palliative treatment consists in relieving the pain with local anesthetics and, as a last resort, morphin. The frequent application of adrenalin and the ligature of the laryngeal arteries possibly may control the growth. Radical treatment includes thyrotomy, with a primary tracheotomy, followed by free excision of all the diseased tissue.

LATERAL SCLEROSIS, PRIMARY (Spastic Spinal Paralysis of the Adult, Primary Spastic Paraplegia, Spasmodic Tabes Dorsalis).—A chronic disease of the spinal cord characterized by paraplegia, contractures of the muscles, with exaggerated reflexes, but without sensory or vesical disturbances or atrophy. A disease of early adult life, generally between 20 and 40, occurring very rarely in children. The etiology is obscure. It has been traced to syphilis, trauma, lead-poisoning, acute infectious fevers, and the puerperium. The lesion is essentially in the pyramidal tracts. The onset is marked by a sense of heaviness and weakness in the legs.

Symptoms.—There is gradual loss of power in the muscles combined with rigidity. The spasms of the legs gradually increase in extent as the power lessens, until at last the legs, whenever extended, pass into a condition of strong extensor spasm, rigidly fixing them to the pelvis, so that the patient lies rigid; if one leg is lifted from the couch by the observer, the other leg is moved also. The spasm may be such that the knee cannot be passively flexed by any force that can be applied to it until the spasm has become less. When flexed, the limb is comparatively supple; but if it is then extended, the spasm instantly returns, making the limb rigid, and often completing the extension, just as the blade of a knife opens out under the influence of its spring—"clasp-knife rigidity." Occasionally there occur brief flexor spasms, drawing the legs up. The tendon and superficial reflexes are markedly exaggerated (Babinski's sign and ankle clonus are easily elicited.) The spastic gait is characteristic, termed by Hammond "the waddle"; the legs drag behind and are moved forward as a rigid whole, the toes catching against the ground, the patient showing a tendency to fall forward. Sensation is unaffected. As the morbid process extends upward, the superior extremities suffer in the same manner as those of the lower. The reaction of degeneration is absent.

The disease may be long protracted, but is incurable. Treatment consists in rest, massage, warm baths. Treatment should be directed to the improvement of the general health. If syphilis is present, mercury and the iodids are indicated. Electricity may be tried.

Hysterical spastic paraplegia simulates the true form, but some hysterical stigmata may appear on careful examination. Recovery may take place under proper treatment.

LATHYRISM.—See LUPINOSIS.

LATIN, MEDICAL.—**The verbs** used in prescription-writing are nearly all in the imperative mood, giving directions to the compounder, and having their object in the accusative case. Such are:

Adde, add.
Cola, strain.
Divide, divide.
Extende, spread.
Fac, make.
Filtra, filter.
Macera, macerate
Misce, mix.
Recipe, take.
Signa, write.
Solve, dissolve.
Tere, rub.

A few verbs are found in the subjunctive mood, taking their subject in the nominative case. The most usual are:

Fiat, let be made.
Coletur, let be strained.
Coloretur, let be colored.
Bulliat, let boil.
Detur, let be given.
Dividatur, let be divided.
Sit, let it be.
Sumatur, let be taken.
Capiat, let take.

Participles or verbal adjectives are occasionally used, and should agree with their respective nouns in gender, number, and case. Such are:

Adhibendus, a, um, to be administered.
Dividendus, a, um, to be divided.
Sumendus, a, um, to be taken.

Prepositions.—The accusative case follows those in the first column, the ablative those in the second column:

Ad, to, up to.
In, into.
Supra, upon.
Cum, with.
Pro, for.
Sine, without.

Ana, of each, governs the genitive case.

Sundry Words and Phrases in Most Frequent Use.

Bis, twice.
Bene, well.
Dein, thereupon.
Et, and.
Gradatim, gradually.
Guttatim, by drops.
In dies, daily.
Da, give.
Non, not.
Numero, to the number of.
Numerus, number.
Octarius, a pint.
Semel, once.
Simul, together.
Statim, at once.
Ter, thrice.
Quater, four times.
Ad saturandum, to saturation.

Quantum sufficiat, as much as necessary.
Pro re nata, according to need.
In partes æquales, into equal parts.
Redactus in pulverem, let be pulverized.
Secundum artem, according to art.
Non repetatur, let it not be repeated.

See Prescription-writing.

Genitive Case-Endings.—(*Potter.*)

Nom.	Gen.	Exceptions.
a	æ	Cataplasma, Enema, Physostigma, Aspidosperma, and Gargarysma all have the genitive in *-atis*. Folia is plural; gen., Foliorum.
us um os on	i	Rhus, Rhois; Flos, Floris; Bos, Bovis; Limon, Limonis; Erigeron, Erigerontis. Fructus, Cornus, Quercus, Spiritus, Haustus, Potus, do not change, being of fourth declension.
as	atis	Asclepias, Asclepiadis; Mas, Maris.
is	idis	Pulvis, Pulveris; Arsenis, Arsenitis; Phosphis, Phosphitis; Sulphis, Sulphitis; and all salts ending in *-is* have genitive in *-itis*.
o	onis	Mucilago, -inis; Ustilago, -inis; Solidago, -inis.
l	-lis	Fel, Fellis; Mel, Mellis; Sumbul, Sumbuli.
e en ps rs r x	es inis pis rtis ris cis	*Words which do not change in the Genitive.* Asedarach, Ethyl[1], Potus Buchu, Fructus, Quercus Cannabis, Gambir, Sabal Caoutchouc, Haustus, Sago Catechu, Hydrastis, Sassafras Chloral[1], Jaborandi, Sinapis Cundurango, Kino, Spiritus Curare, Matico, Sumbul Digitalis, Menthol[1], Thymol[1]

LAUDANUM.—The tincture of opium, containing about 48 grains of opium to the ounce. The dose is from 5 to 30 minims, according to the effect desired. It is the form of opium mostly used in liniments, and for external applications, as with lead-water. See Opium.

LAUGHING GAS.—See Nitrous Oxid, Anesthetics.

LAVAGE.—Irrigation or washing out of the stomach.

Uses.—Lavage is more valuable for diagnosis than for treatment. In cases of chronic indigestion and often in neurasthenia, constipation, insomnia, and especially in stubborn headaches, it is of value to make an analysis of the stomach-contents under varying conditions, to determine exactly what sort of work the organ is doing as to its secretory, absorptive, and motor functions. When such tests show a large amount of mucus, gastric catarrh may be suspected; and in most cases of chronic catarrhal inflammation of the stomach lavage will do good; in many of them it is almost indispensable. More often the mucus comes from the parts above, having been swallowed; and the diagnosis of chronic gastric catarrh, which many physicians attempt to make offhand, frequently presents difficulties, even with the help of chemic and microscopic examinations of the stomach-contents. See Stomach.

The most imperative indication for lavage is gastrectasis, or aggravated dilatation of the stomach, whether resulting from narrowing of the pyloric orifice (cancer or other tumors, or the cicatrix of an ulcer), from a kink of the small intestines (which may follow displacement of the stomach, colon, or right kidney), or from atony of the muscular walls of the organ. Whatever the cause, dilatation, when neglected, tends to become a serious condition, and lavage judiciously done is an aid to the cure in the atonic cases, while it is a most valuable palliative in the desperate ones until operative relief can be obtained. In bad cases of gastric catarrh and in patients not too reduced in strength, provided all the results are encouraging, it will be proper to wash out the stomach every day at first, until the amount of mucus is markedly lessened. This will be the more advisable if the microscope shows the presence of numerous yeast fungi or sarcinæ in the wash-water. As the conditions improve, or sooner if the patient should fall off in flesh, cardiac tone, or appetite, the intervals should be prolonged, until by the end of a month or two, once or twice a week may often be enough. When the treatment has been begun early and is properly carried out, one will often succeed in removing all the symptoms and signs of disease within 2 months; but in very advanced or debilitated cases, one will need to be guided by the effects, and sometimes, in such cases, a radical cure is scarcely practicable outside of a special institution. The best that can be accomplished then, under ordinary conditions, is palliation, and for this it is useful to cleanse away the accumulated mucus and bacteria at least once a week for long periods (Reed).

Time.—In nearly all cases the best time for lavage is before breakfast. Many good authorities advise that lavage should be done at bedtime when fermenting food in the stomach prevents sleep. Exceptionally this may be useful, especially in cases of gastralgia, but diseased stomachs are rarely empty at bedtime, and experience teaches that, as a continuous practice, washing away half-digested food is disastrous. When severe fermentation cannot be otherwise controlled, it would be better to feed less by the stomach and supplement by nutritive enemata.

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[1] In the B. P. Chloral, Ethyl, Menthol, and Thymol are Latin nominatives, and do not change in the genitive, (*e. g.*, Syrupus Chloral, Liquor Ethyl Nitritis, Emplastrum Menthol). In the U. S. P. the corresponding nominatives are Chloralum, Æthyl, Menthol, and Thymol; but the genitive of Æthyl is Æthylis, and that of Thymol is Thymolis, (*e. g.*, Æthylis Carbamas, Thymolis Iodidum).

Method.—The best and the simplest apparatus is a medium-sized tube, though the larger the better, provided the patient tolerates it well. It should be long enough to extend 3 feet from the mouth. A bulb in the course of it will be helpful in case of blocking; and a separate large glass funnel holding a pint is much better than the small soft-rubber ones that are found attached to many of the tubes in the shops. Warm water, sterilized by boiling, with or without bicarbonate of sodium dissolved in it to the extent of 1 or 2 teaspoonfuls to the quart, is used. If there is doubt as to the diagnosis, simple boiled water may be used.

When there is a marked deficiency of hydrochloric acid, the water may be hotter, and table salt, from a teaspoonful to a tablespoonful, may be added to each quart. Exceptionally, stronger antiseptics or astringents may be used—alum, one-half to a teaspoonful, and silver nitrate, 1 or 2 grains to the quart, but this should be followed with a salt solution after the silver nitrate. The patient's garments should be protected with towels or oilcloth. If the throat is very sensitive, it should be sprayed with a solution of cocain (3 or 4 percent) in liquid vaselin, to which has been added 1 grain of menthol.

It is not necessary to lubricate the tube with glycerin or vaselin, but it may be dipped in water.

The process of introduction must be an educative one, and the first trial may fail.

The patient should sit in a low chair with his head thrown back; the mouth should be opened about two-thirds its full width, and the patient is instructed to breathe naturally. The index-finger of the operator is then inserted well back into the pharynx, and the tube is pushed along the side of the finger to the posterior wall of the pharynx and down into the entrance of the esophagus; the patient is then instructed to swallow, at the same time gradually pushing the tube onward until it has entered the stomach. The average distance from the incisor teeth to the lower border of the stomach is 22 inches. In gastric dilatation it is more than this.

The tube, with the funnel inserted in it, having been introduced, the solution, previously prepared and placed in a pitcher at hand, is poured in, a pint or quart at a time. Just before the last of the water has disappeared from the funnel the latter should be carried quickly down toward the floor and held in the inverted position over a pail. By siphonage the liquid now flows back into the inverted funnel, where it may be inspected before emptying. A piece of glass tubing inserted at some point of the tube outside the mouth, or between two sections of the tube, will enable one to see when the liquid is flowing through properly. One quart of water is quite as much as most patients will care to have used in the first washings, but later the quantity may be gradually increased, until finally several quarts, or enough to cleanse away all the mucus, may be introduced; but not more than 1 quart at a time, and in some very weak stomachs a pint at a time, will be more advisable. It has been found that to lessen considerably the time required to loosen and detach all the mucus in old gastric catarrhs it is advisable to have the patient drink a cup or two of warm water before taking the tube, and then, lying down on the back, make voluntary contractions of the abdominal muscles so as to splash the water around in the stomach for 3 to 5 minutes. When this is done, scarcely one-half the usual quantity of water is required in the washing out, which follows directly afterward. Delicate patients should be allowed to rest in the recumbent position half an hour at least after lavage, and in no case should a meal be eaten within that time after the procedure.

The tube should be withdrawn gradually while the patient is in a sitting posture.

Lavage in Infants.—Lavage is a very valuable therapeutic measure in infants. In children over 18 months or 2 years of age it is more difficult of application and not, as a rule, useful. The indications for stomach-washing are acute indigestion, either with or without persistent vomiting, when a single washing may be sufficient; and certain cases of chronic indigestion when daily washing is necessary, and in poisoning.

Apparatus and Method.—A soft-rubber catheter connected by a short glass tube to a piece of rubber tubing and a glass funnel, as described under GAVAGE (*q. v.*), are all the apparatus necessary. The catheter should be as large as can be easily passed (about No. 24 French), and should have one or more large eyes. The child should be held in the sitting position and its body protected by a rubber sheet. The tongue is depressed with the forefinger of the left hand, and the catheter moistened and passed rapidly back into the pharynx and down the esophagus. About 10 inches of the catheter should be passed beyond the lips.

When the stomach is reached, the funnel is momentarily raised to allow the gas to escape, then lowered in order to siphon out any fluid which may be in the stomach. If nothing escapes, the funnel is raised and from 4 to 6 ounces of water poured into it, when the funnel is again lowered and the water siphoned out. This procedure is repeated from 4 to 10 times or until the water returns perfectly clear. Boiled water should be used at 100° to 110° F.—the higher temperature when there is great gastric irritation.

It is not often advisable to add anything to the water, but in some cases a weak solution of boric acid or a salt solution, a teaspoonful to the pint, may be used.

LAVENDER (Lavandula).—The fresh flowers of *Lavandula officinalis*. They have a fragrant odor, and an aromatic, camphoraceous taste; and contain resin and tannin, also a *volatile oil.*

Lavender is aromatic, stimulant and carminative, but is rarely used alone as a medicine. It is an agreeable flavoring and perfume, in the form of the official spirit, which is sold under the name of *lavender-water*, after the addition of oil of bergamot and essence of ambergris. The compound tincture is a very agreeable combination of spices, and is much used as a remedy for gastralgia, nausea, and flatulence, and as an adjuvant or corrigent of other medicines.

Preparations.—Oleum lavandulæ florum, a volatile oil distilled from fresh lavender, and having the fragrant odor of the flowers. It is soluble in alcohol in all proportions, in 3 times its volume of a mixture of alcohol 3 and water 1, and in glacial acetic acid. Dose, 1 to 5 minims. **Spiritus L.** has of the oil 5, in alcohol 95. A perfume and flavoring agent. Dose, 10 to 45 minims. **Tinctura L. Composita,** an aromatic stimulant, composed of the oil 8, oil of rosemary 2, saigon cinnamon 20, cloves 5, nutmeg 10, red saunders 10, alcohol 750, water to 1000. Is a constituent of Fowler's solution. Dose, 10 to 45 minims.

LAXATIVES.—See CATHARTICS.

LEAD (Plumbum).—Symbol, Pb. Atomic weight, 207; quantivalence, ii or iv. A bluish-white, soft, malleable metal, obtained from a native sulphid called galena, by roasting. Soluble salts of lead combine with albumin, forming albuminates. In large doses by the stomach they are irritant to the mucous membrane. Upon the intestines they act as powerful astringents. If absorbed into the circulation in small quantities for a considerable period of time, lead causes a very interesting and varied group of symptoms, which are described below. Lead is eliminated through the kidneys and the intestinal mucosa. It appears to check the elimination of uric acid, and is, especially in England, a factor in the causation of gout in lead-workers. In medicine lead is used locally as a sedative to inflamed parts, as an astringent to mucous surfaces, as in gonorrhea and leukorrhea.

Therapeutics.—Lead salts are chiefly used as astringents and hemostatics. The solution of the subacetate, diluted with 4 parts of glycerin and water, is locally employed in many skin-diseases, especially in eczema, lichen, impetigo, and erythema; also in catarrhal discharges of mucopurulent character from the ear, vagina, and urethra, particularly in gonorrhea and leukorrhea. Inflammations of external parts are constantly treated by the lotion of "lead-water and laudanum" (liquor plumbi subacetatis dilutus, 7 parts to 1 of tinctura opii).

Internally the acetate, in 2-grain doses every 3 hours, is used in various internal hemorrhages, particularly hemoptysis, hematemesis, and gastric ulcer. The same salt is used in smaller doses in bronchorrhea, and with powdered opium if there are choleraic symptoms, and still smaller doses for the summer complaint of children. In caseous pneumonia and in cardiac hypertrophy, and in whooping-cough with excessive bronchial secretion, and in humid asthma, the acetate is also useful.

The carbonate is useful in erythema, erysipelas, intertrigo, and as white paint, mixed with linseed oil, applied to burns or scalds only when the cuticle is unbroken.

The iodid is useful as an ointment for enlarged lymphatic glands and enlarged spleen, and in chronic eczema and psoriasis. The nitrate is serviceable when applied to fissured nipples, 10 grains to 1 ounce of glycerin. In solution it is deodorant to the fetor of gangrenous sores, ozena, and other offensive discharges.

Acute poisoning is rare, as the salts of lead are not often chosen by the intending suicide. It is treated by encouraging emesis and washing out the stomach. Dilute sulphuric acid, 30 minims in water, or the sulphate of magnesia or soda, 1/2 of an ounce, should at once be administered, all well diluted with water. Milk or the white of egg is to be freely given. Morphin given hypodermically and poultices may be employed. A subsequent course of potassium iodid is advisable.

Chronic poisoning is called **saturnism** or **plumbism.** It is most common in those whose occupation exposes them to contact with salts of the metal, such as painters, glaziers, workers in white-lead works, etc. Drinking-water and foods may also convey the poison to the system; so may cosmetics impregnated with lead; indeed, the sources of poisoning are manifold and often very curious.

The forms of chronic lead-poisoning may be grouped as follows: (1) *Lead colic*, the most frequent. The pain is centered about the umbilicus, the abdomen is retracted, constipation obstinate, the pulse corded. See COLIC. (2) *Lead palsy*, wrist-drop or drop-wrist. This is a paralysis of the extensor muscles of both forearms; it may be associated with sensory disturbances. Paralysis of the ocular and the laryngeal muscles has also been observed. (3) *Saturnine encephalopathy*. (4) *Saturnine arthralgia*, a painful affection of the joints, especially the knee, rarely the others. Objective signs are usually absent. The disease may resemble chronic gout. (5) *Chronic contracted kidney*. (6) *Amblyopia* due to atrophy of the optic nerve. The general symptoms of lead-poisoning are a marked anemia and cachexia, and a blue line at the edge of the gums.

Treatment.—Prophylaxis is of the first importance, and among workers absolute personal cleanliness, extending to the finger-nails, the use of a working suit, a daily warm bath after work, eating outside the works, and the use of respirators are the chief preventive measures. "Treacle beer" and sulphuric acid lemonade are beverages of service in preventing the effects of the metal. Constipation is to be relieved by occasional doses of magnesium sulphate.

Dry, hot fomentations to the abdomen are the best application for the lead colic. Magnesium sulphate is an excellent purgative, and may be administered after the more acute symptoms have subsided, in combination with potassium iodid. Castor oil, with 5 to 10 minims of the tincture of opium added to each dose, is useful to clear the bowel.

Massage is the best treatment for the paralysis of lead poisoning, and the electric current may be applied daily for about 10 minutes. A long period of treatment is necessary.

Incompatible with *lead salts* are: Alkalies mineral acids and their salts, albuminous solutions, opium, potassium iodid, vegetable acids, vegetable astringents, waters containing lime, sulphates, carbonates, and carbonic acid gas. With *lead acetate* are: Acids, acetamid, alkalies, bromids, carbonates, chloral hydrate, chlorids, chromates, cyanids, glucosids, gums, hydrochloric acid, iodids, opium, phenol, pyrocatechin, pyrogallol, resorcinol, salicylic acid, sodium phosphate, sodium salicylate, sulphates, sulphids, sulphites, tannic acid, urea, urethane, vegetable decoctions, infusions and tinctures. With *solution of lead subacetate* are: Acacia, acids (organic), albumin, alkaloids, antipyrin, glucosids, and otherwise like lead acetate.

Preparations.—**P. Acetas** (*sugar of lead*), colorless, shining, prismatic crystals or scales, efflorescent, of faintly acetous odor and acid reaction, and a sweetish, astringent and metallic taste. Soluble in 2.3 of water and in 21 of alcohol at 59° F., in 0.5 of boiling water and in 1 of boiling alcohol. Dose, 1/2 to 2 grains. **P. Iodidum,** a heavy, bright, citron-yellow powder, odorless and tasteless, fusible and volatilizable by heat; soluble in about 2000 of water at 59° F., and in about 200 of boiling water. Used externally as an ointment. May be given internally in doses of 1/5 grain twice daily. **P. Nitras,** colorless, opaque, octahedral crystals, odorless, of sweetish, astringent and metallic taste and acid reaction; soluble in 2 of water at 59° F., almost insoluble in alcohol. Used locally as an astringent and deodorizer in solutions up to 1 percent, also as an escharotic and a disinfectant. **P. Oxidum** (*litharge*), a heavy, yellowish, or reddish-yellow powder, odorless and tasteless; insoluble in water or alcohol, but almost wholly soluble with slight effervescence in dilute nitric acid. When heated in contact with charcoal it is reduced to metallic lead. Used as plaster and sometimes with oil as an external application. **Liquor P. Subacetatis** (*Goulard's extract*), an aqueous solution containing about 25 percent of the salt, prepared from acetate of lead 18, oxid of lead 11, and distilled water to 100. It is a clear, colorless liquid, of sweetish, astringent taste and alkaline reaction, and when added to a solution of acacia it produces a dense, white precipitate. Used locally as an astringent and cooling lotion, diluted usually with an equal quantity of water. **Liquor P. Subacetatis Dilutus** (*lead water*), has of the preceding 4, in distilled water to 100. Used locally as a mildly astringent and cooling lotion. **Ceratum P. Subacetatis** (*Goulard's cerate*) has of the solution of lead subacetate 20 percent, with camphor 2, wool fat 20, paraffin 20, white petrolatum 38. An astringent application. **Emplastrum P.,** has of lead acetate 60, soap 100, each dissolved in hot water, mixed, and the liquid decanted. It is pliable and tenacious, and forms the basis of other plasters. **Emplastrum Adhesivum,** has of rubber 2, petrolatum 2, lead plaster 96. **Unguentum Diachylon,** has of lead plaster 50, olive oil 49, oil of lavender flowers 1. Used locally in eczema and other cutaneous disorders.

LECITHIN.—A phosphorized fat found combined with proteids in nervous tissue, yolk of eggs and in almost all animal and vegetable cells. The lecithins are esters of the fatty acids and glycerophosphoric acid in combination with cholin. Lecithin stimulates nutrition, causing an increase in the number of erythrocytes and in the percentage of hemoglobin and in the amount of reserve proteids. It is believed to be efficient in malnutrition and is said to be especially valuable for bottle-fed infants. Dose, 1 1/2 to 8 grains before meals in pill form; for infants one-third as much.

LEECHING.—The use of leeches is indicated when it is desired to abstract blood from localities which, from their position or from excessive tenderness, are with difficulty operated upon by the knife. They are particularly valuable in inflammations of the eye and ear. In order to imitate as near as practicable the conditions under which these animals secure their food, the skin over the selected locality should be carefully cleansed, especially should all traces of soap be removed, and of such pungent medicaments as turpentine, liniments, etc., otherwise the animals will refuse to bite. A little blood or milk smeared upon the skin will often induce leeches to take hold. Medicinal leeches are of two kinds, the Swedish and American. The former are much the more powerful, and, at least in the treatment of adults, are, as a rule, preferred. Each abstracts from 1/2 an ounce to 1 ounce of blood. The American leech is one-sixth the strength of the European. When a number of leeches are to be applied, as over the abdomen in nervous persons, and each bite causes alarm, the leeches may be placed in a half glass of cold water, and by an adroit movement the glass may be inverted on the part; the leeches will attach themselves rapidly; the water may be drained away and caught in a pledget of absorbent cotton. Leech-bites are likely to continue bleeding. The bleeding may be controlled by pressure, Monsel's solution on cotton, styptic cotton, or, if these fail, by the application of the actual cautery. Leeches should not be applied where the skin is delicate or loose, as on the eyelids or scrotum. To remove a leech easily, apply a small quantity of table salt to it.

The **Heurteloup's apparatus,** or **artificial leech,** is of great value when leeches cannot be obtained.

LEG, AMPUTATION.—Improvements in artificial limbs have rendered obsolete the rule that made the point of election for amputation of the leg three inches below the tubercle of the tibia. Amputations just above the ankle, are unsatisfactory but unfortunately the teaching of a past era still prevails in certain localities.

The operation is applicable to any portion of the leg below the knee-joint to a point within 3 inches of the ankle.

The Anteroposterior-flap Operation.—The 2 flaps are of the same length: that of the anterior being cut from without inward, and the posterior being procured by transfixion. The patient is brought well to the edge of the table; the limb to be removed is laid upon a pillow, supported at the heel by an assistant. The operator places the thumb of the left hand on a point just below the fibula, and the index-finger a little below the line of the internal border of the fibula; with these points as guides, a semilunar flap is cut, somewhat longer than half the diameter of the limb, through the skin and fascia; this is dissected back to the points where the index-finger and thumb of the left hand rest; a transfixion knife is then entered just below the fibula, and being carried through the tissues, is made to protrude on the other side, opposite the point of entrance, when a posterior flap is cut of the same length as that for the anterior. Any muscles which have not been divided are to be severed by a circular sweep of the knife; the interosseous space is divided, the periosteum pushed back, and the bones sawed through. After the limb has been removed, saw off the sharp edge of the tibia and cut off 1/2 of an inch of the fibula, which insures a better stump. Secure the vessels, apply necessary drainage, and close the wound in the usual manner.

Double-flap method, at the upper fourth of the leg. A stout bistoury, with blade 4 or 5 inches long, and a broad saw are the cutting instruments required. The flaps are made of integument only, by cutting from the surface without transfixion. The point of the knife is entered at the side, about 2 inches below the tibial tubercle, and carried across the front of the leg, describing an anterior curved flap, somewhat longer than, and of the exact width of, the half diameter of the limb. This is dissected up close to the bones and deep fascia. A similar flap is made on the posterior aspect, and the integument and fascia composing it are raised from the muscles. The latter, with the large vessels and nerves, are then divided transversely, direct to the bone. The point of the knife must be used to divide the intervening structures. The bones are then divided straight across.

The anterior tibial artery is often divided as it passes between the bones to the front of the leg, and it may be difficult to get it separated from the surrounding ligamentous structures.

Single-flap Operation.—The operator places the heel of the knife on the side of the limb furthest from him, then draws it across the front of the limb, cutting a semilunar flap of skin; when its point arrives at the opposite side, it is made to transfix the limb, and then the posterior flap is cut. Care must be taken not to get the knife between the bones when making the flap by transfixion. The muscles and ligamentous structures which are between the bones are then divided by the point of the knife. The fleshy mass of the gastrocnemius may require to be cut out to make the posterior flap thinner.

The Circular Operation is especially adapted to removal of the leg at the lower third of its length. One assistant supporting the foot and another holding the knee, and at the same time drawing up the skin, the surgeon makes a circular incision through the skin, 4 inches below the point where the bones are to be divided. The integument is then dissected up for 2 inches and turned back, and the muscles divided down to the bone by a second or third circular incision. A catling is then passed between the bones to divide the interosseous ligament and muscles, and both bones sawed through together, the flesh being protected by a three-tailed retractor, the middle tail passing between the bones; to prevent splintering, the division of the fibula should be completed before that of the tibia. The anterior and posterior tibial are the principal arteries requiring ligatures. The modified circular operation may also be satisfactorily performed at this part of the leg. See AMPUTATIONS.

LEG, BOW-. See GENU VARUM.

LEG, FRACTURES. Fracture of the tibia at its upper end usually results from compression by the opposite condyle of the femur, as in falling from a height and landing on the feet. The symptoms are those of a severe contusion; joint-movements are painful, lateral movements usually possible, with distinct painful points at the upper end of the tibia. Generally the fracture is of only one-half of the articular surface, so varus and valgus positions are liable to result.

Treatment is by fixation by splint or weight with early massage and movements as in all articular fractures.

Traumatic separation of the upper epiphysis of the tibia is rare. It is to be suspected in cases of severe contusion at the upper end of the tibia. Abnormal mobility and cartilaginous crepitation can alone make the diagnosis positive.

Treatment is on general principles.

Separation of the tuberosity of the tibia rarely occurs. The traction of the quadriceps sometimes tears off the tuberosity instead of fracturing the patella. The fragment is drawn upward, active extension at the knee is impossible, the fragment is felt under the skin movable in all directions, while the patella is found intact.

Treatment is very similar to that described for fractured patella. See KNEE. The joint need not be implicated; hence the best treatment is to secure the replaced fragment in place by open suture.

Fracture of the shaft of the tibia may occur isolated as a result of torsion or bending, being transverse, as a rule, in the upper part of the bone, and oblique in the lower.

The symptoms are clear and easily recognized. If the fibula remains unbroken and there is much longitudinal displacement, the head of the fibula must be dislocated upward. This is most likely to occur in fracture of the upper half of the shaft. If the fibula remains intact and is not luxated, marked displacement of the fragments cannot well occur.

Treatment.—If marked swelling has already occurred, it is best for a few days to elevate the limb in a fracture-box and make local sedative applications. The swelling having in a large degree subsided, a close-fitting plaster-of-Paris dressing is applied, fixing the knee and taking in the foot. This dressing should extend to the upper part of the thigh and be well padded under the tuberosity of the ischium, which is designed to rest upon it, a perineal crutch in this way being provided. A 2-inch cotton pad is placed on the sole of the foot before the plaster is applied. When the patient is on his feet, the splint catches the body weight on the tuberosity of the ischium, while the foot descends into the thick cotton pad mentioned. This constitutes the so-called **ambulatory splint.** If there is not great tendency to displacement, the patient may be placed on his feet by the end of the first week, or even at once, using crutches at first and then getting about by the aid of a stick alone. It will usually be found necessary to put a high sole on the shoe of the sound side. In 4 weeks the dressing can be removed and a lighter one supplied, which is worn for 2 or 3 weeks longer, when dressings can be discarded.

Isolated fracture of the fibula is somewhat rare, especially in its middle and upper portions, and it is due to direct violence. Fracture at the lower end may be due to violent eversion or inversion of the foot. There is little tendency to displacement.

Treatment.—Plaster-of-Paris is the best dressing. The knee need not be fixed. The foot should be placed in slight inversion, at a right angle to the leg, and fixed in the dressing.

Fracture of both bones of the leg in the region of the diaphysis is a frequent injury, the result of direct violence, both bones usually being fractured at the same level. Sometimes, the foot being fixed and the body twisted, a torsion fracture of the tibia results; the weight of the body then falls on the tibia, which is broken secondarily and frequently higher up on the shaft. Oblique fractures are, of course, more liable to considerable displacement, and are relatively less favorable than transverse. The lower fragment of the tibia is usually displaced upward behind the upper fragment, and rotated a little outward. This ascent is largely due to the action of the calf-muscles.

This fracture is easy of diagnosis, abnormal mobility, crepitation, and displacement being readily demonstrated. Palpation of the crest of the tibia in the two directions discloses the point of fracture, and also any rotation of the lower fragment. The exact point of fracture of the fibula is sometimes difficult of determination.

Treatment.—In fracture near the ankle-joint the pull of the calf-muscles tends sometimes to maintain deformity, and may even demand tenotomy of the Achilles tendon. For the first 3 weeks 1 posterior and 2 side splints should be used, or a fracture-box may be employed. The dressings should be removed and the fracture inspected and controlled at the end of each week. After this time plaster-of-Paris can be employed, and the treatment be made ambulatory, as already indicated for isolated fracture of the tibia. After healing, a painful bony prominence may persist on the crest of the tibia, which may require removal by the chisel. See KNEE, ANKLE (Fractures).

LEGITIMACY, LAWS.—The law assumes that every child born in wedlock is legitimate unless it can be shown that the man and wife had been separated for a longer time than that accepted as the average period of gestation, or unless it can be proved that the husband was impotent. The accepted period of gestation is from 268 to 313 days. A child is regarded as legitimate though not conceived in wedlock, if the mother afterward marries and her condition is recognized by the husband at the time of the marriage.

LEMON (Limon).—The fruit of *Citrus limonum*, official in two forms: (1) Orange, *Citrus vulgaris* and *C. aurantium*, and (2) Lime, *C. acris*. The rind contains an official volatile oil, and a glucosid. The pulp yields about 7 percent of citric acid, $C_6H_8O_7$, which has about the same properties as acetic acid, but has much value as a refrigerant and antiscorbutic. The expressed juice is largely employed as a refrigerant drink in fevers. **L., Ol.**, the volatile oil. Dose, 1 to 5 minims. **Tinct. Limonis Corticis**, a 50 percent tincture, made with alcohol. Dose, according to the amount of alcohol desired to be given, 1/2 to 4 drams. **Acidi Citrici, Syr.**, citric acid, water, tincture of lemon peel, each 1; syrup to 100.

LENIGALLOL.—Pryogallol triacetate. A substitute for pyrogallol in psoriasis, lupus, etc. It is applied in 5 to 10 percent ointment with zinc oxid.

LENSES.—A lens is a transparent refracting medium, usually of glass or crystal, which is bounded by two curved surfaces or a curved surface and a plane surface.

Lenses may be considered as a juxtaposition of prisms with different refracting angles. Convex lenses are equivalent to prisms with their bases placed together; and concave lenses, to prisms with their apices placed together. Therefore, rays of light always being deflected toward the base of a prism, will be rendered convergent by convex lenses, in which the prismatic bases are central; and will be rendered divergent by concave lenses, in which the prismatic bases are peripheral.

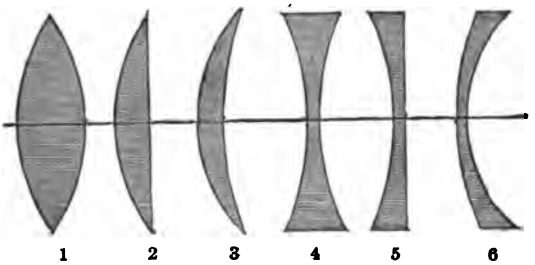
Spheric lenses are used in ophthalmology in 6 different forms:

1. Biconvex, segments of two spheres having two convex surfaces.
2. Planoconvex, the segment of one sphere, having a plane surface on one side and a convex surface on the reverse side.
3. Concavoconvex, or converging meniscus.
4. Biconcave, having two concave surfaces.
5. Planoconcave, having on one side a plaen surface and on the reverse side a concave surface.
6. Convexoconcave, or diverging meniscus.

Numbers 3 and 6, having opposite sides at different surfaces, are called periscopic or meniscus lenses, and are used to avoid spheric aberration and to gain a greater field of clear vision.

The principal axis of a lens is a line passing through the optic center at right angles to the surfaces of the lens. Rays passing through this axis are not refracted. Rays passing through the optic center of a lens, but not passing through the principal axis, are slightly deviated, although in practical optics they may be considered as straight lines. The focal length of a lens is the distance from the lens to the point at which parallel rays, refracted by the lens, focus.

A cylindric lens is a lens with a plane surface in one axis, and a convex or a concave surface in the axis at right angles. This form of lens is really a segment of a cylinder. Examination of any cylinder—as, for instance, a bottle—will show there is curvature only in one direction, from side to side, and not in the axis. As the axis of a cylinder has a plane surface, the rays are only refracted at right angles to the axis, and the strength of the cylinder depends on the curvature possessed by the surface at right angles to the axis. The axes of the cylinders in a test case are usually shown by grinding and making partially opaque portions of each side of the lens in the direction of the axis.



DIFFERENT FORMS OF SPHERIC LENSES.
1. Biconvex lens. 2. Planoconvex lens. 3. Concavoconvex or convergent meniscus. 4. Biconcave. 5. Planoconcave. 6. Convexoconcave, or divergent meniscus.

It must be remembered that a cylinder refracts rays of light only in the meridian at right angles to its axis, while a spheric lens refracts rays of light in every meridian.

Classification and Numbering of Lenses.—Lenses are numbered according to their focal distance, and the strength of the lens varies inversely as its focal distance. Formerly, lenses were numbered according to the **inch system,** the unit of which was a lens whose focal distance equaled 1 inch—a very strong lens. This system necessitated the use of large numbers or fractions; and, moreover, the denomination inch had different significations in different countries, the French inch, for example, varying from the English inch. The **metric** or **dioptric system** of numbering lenses is now in use, and the unit is a lens having a focal distance of 1 meter and is called a lens of 1 diopter strength—a comparatively weak lens; a 2-diopter lens is one having half the focal length of the 1-diopter lens, or 1/2 of a meter. Decimals, of course, are used instead of fractions; a lens of a focal length of 4 meters is called a 0.25-diopter lens.

Convex lenses form real images, and are called positive or plus lenses, and are designated by the sign +.

Concave lenses produce only virtual images, and are called negative or minus lenses, and are designated by the sign −.

To convert a prescription written in the old system of numbering lenses into the modern metric system of diopters, we can roughly consider the meter as equivalent to 40 inches. A 10-inch lens would be equivalent to a lens having a focal length of 1/4 of a meter, or 4 diopters.

The following table from Landolt gives the equivalents in both the old and new systems:

OLD SYSTEM.				NEW SYSTEM.			
No. of the Lens, Old System.	Focal Distance in English inches.	Focal Distance in Millimeters.	Equivalent in Diopters.	No. of the Lens, New System.	Focal Distance in Millimeters.	Focal Distance in English inches.	No. Corresponding of the Old System.
72	67.9	1724	0.58	0.25	4000	157.48	166.94
60	56.6	1437	0.695	0.5	2000	78.74	83.46
48	45.3	1150	0.87	0.75	1333	52.5	55.63
42	39.6	1005	0.99	1	1000	39.37	41.73
36	34	863	1.16	1.25	800	31.5	33.39
30	28.3	718	1.39	1.5	666	26.22	27.79
24	22.6	574	1.74	1.75	571	22.48	23.83
20	18.8	477	2.09	2	500	19.69	20.87
18	17	431	2.31	2.25	444	17.48	18.53
16	15	381	2.6	2.5	400	15.75	16.69
15	14.1	358	2.79	3	333	13.17	13.9
14	13.2	335	2.98	3.5	286	11.26	11.94
13	12.2	312	3.20	4	250	9.84	10.43
12	11.2	287	3.48	4.5	222	8.74	9.26
11	10.3	261	3.82	5	200	7.87	8.35
10	9.4	239	4.18	5.5	182	7.16	7.6
9	8.5	216	4.63	6	166	6.54	6.93
8	7.5	190	5.25	7	143	5.63	5.97
7	6.6	167	5.96	8	125	4.92	5.22
6½	6.13	155	6.42	9	111	4.37	4.63
6	5.6	142	7.0	10	100	3.94	4.17
5½	5.2	132	7.57	11	91	3.58	3.8
5	4.7	119	8.4	12	83	3.27	3.46
4½	4.2	106	9.4	13	77	3.03	3.21
4	3.8	96	10.4	14	71	2.8	2.96
3½	3.3	84	11.9	15	67	2.64	2.8
3¼	3.1	79	12.7	16	62	2.44	2.59
3	2.8	71	14.0	17	59	2.32	2.46
2¾	2.6	66	15.1	18	55	2.17	2.29
2½	2.36	60	17.7	20	50	1.97	2.09
2¼	2.1	53	18.7				
2	1.88	48	20.94				

Varieties of Lenses Used to Correct Refractive Errors.—1. The simple sphere may be either convex or concave, and is used to correct the uncomplicated forms of refractive errors.

2. The simple cylinder is limited in refractive power to the direction of its curvature, and is used in cases of simple astigmatism in which there is an error of refraction in only one meridian of the eye.

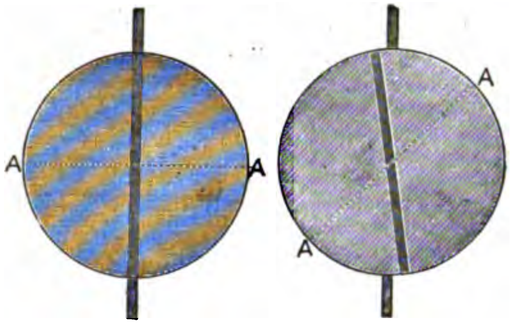
3. The spherocylinder is a combination of a sphere with a cylinder, and is used in cases of compound or mixed astigmatism in which there is a different refractive error in the two principal meridians of the eye.

4. The cross-cylinder is a form of lens made up of two cylinders with their axes at right angles to each other. It is seldom prescribed, but is occasionally used in making tests.

For a further description of test-lenses, see REFRACTION.

Neutralization of Lenses.—The lens is held a few inches in front of the eye, and some object, such as the vertical and horizontal lines of a window-frame or the test-letters, is viewed through it. The lens is then moved to the right, and if it is convex, the object will move to the left; if it is concave, the object will move with the lens to the right. Having determined what sort of a spheric lens we have under examination, we proceed to neutralize it by holding successively a concave lens if convex, or a convex lens if concave, until no movement of the object is perceived through the lens; therefore, **to find the strength of a spheric lens,** it is only necessary to combine it with successive lenses of the opposite sign, until one is found which neutralizes the apparent movement of objects seen through the lens under examination. The more rapid the apparent movement, the higher the power of the lens required to neutralize.

Cylindric lenses only show movement in the direction opposite to their axes; the movement is against in convex cylinders and with in concave cylinders. To find the axis, an object presenting a straight line, such as the vertical line of the window-sash or the edge of a frame, is viewed through the lens. As the lens is rotated about the visual axis the portion of the vertical line seen through the lens will appear to be oblique, as compared to that seen above and below the lens. This oblique displacement takes place in a direction contrary to the rotatory motion given a convex lens, and in the same direction as the rotatory motion given a concave lens. To ascertain the position of the axis of a cylinder it is slowly rotated until the line seen through it appears continuous above and below. If motion from side to side produces apparent motion of the object, this line is the axis of the cylinder, and if no motion results, the line is at right angles to the axis of the cylinder. The axis being determined, the cylinder is neutralized by successive cylinders of opposite curvature applied in the same axis.



NEUTRALIZATION OF CYLINDRIC LENSES.

Spherocylindric lenses are neutralized the same way as two cylinders with their axes perpendicular to each other. Having neutralized the movement in one meridian, we note the result and neutralize the movement in the other meridian.

The phacometer is an instrument designed rapidly to discover the strength of lens under examination. It is operated by pressing the surface of a spheric lens squarely against three steel pins, the central one of which is movable. When the central one is depressed until all three points touch the glass, the curvature of the lens is indicated on the dial.

LENTIGO.—See FRECKLES.

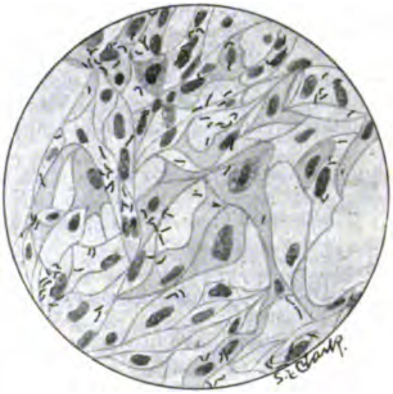
LEONTIASIS OSSEA.—See BONE, (Diseases).

LEOPARD'S-BANE.—See ARNICA.

LEPROSY.—Lepra vera; elephantiasis Græcorum; black leprosy.

An endemic, chronic, constitutional disease, analogous to syphilis, and varying in its morbid manifestations according as the brunt of the disease falls on the skin, the nerves, or other tissues. It occurs in 3 forms: the tuberculous, the nontuberculous or anesthetic, and the mixed tuberculous.

The tuberculous or nodular leprosy is attended at the onset by debility, depression, dyspepsia, diarrhea, drowsiness, chilliness, and profuse perspiration, marked vertigo, recurrent epistaxis, fever up to 104° F.; after a variable period of days, or even months, coming first with edema of the eyelids, the leprous spots appear on the face and ears, and then on the anterior and external surfaces of the limbs. The exanthem is an erythema, varying from a bright-red to a purplish-red or mahogany-red tint, associated with the leprous deposit of well-defined, shiny, slightly raised patches of from one to several inches in diameter. Papules then form in crops, gradually reaching the size of a hen's egg and of a yellowish to a dark-brown color. Tuberculation does not develop until from 3 to 6 months after the commencement of the disease. Nodules are most common on the face, limbs, breast, scrotum, and penis. There is also an involvement of the mucous membranes. When the disease is fully developed, the face assumes the characteristic leonine appearance, from thickening of the skin. Ulceration eventually sets in, and the patient dies of exhaustion or complications.



BACILLUS LEPRÆ (EXTRACELLULAR).—(*Coplin.*)

Nontuberculous leprosy is the most common tropical form. The prodromal symptoms are marked, and are associated at first with hyperesthesia of the skin. At the end of a year the special eruption breaks out, usually on the back, shoulders, posterior aspect of the arms, nails, thighs, and sometimes in the course of nerves. The spots are 1 or 2 inches in diameter, well defined, not raised, and of a pale yellow color. They spread peripherally, clearing in the center, which becomes dry, scaly, and anesthetic. Paralysis is usually a late symptom, and ulceration is common. Death results from ulceration, gangrene, marasmus, or general debility.

Mixed tuberculous leprosy is the least common form, and its symptoms are a combination of those of the other two varieties. Destruction of the cartilages of the nose and of the soft palate is common.

Etiology.—Leprosy is caused by the invasion of the organism by the bacillus lepræ. Heredity, climate, soil, and mode of living may act as predisposing causes.

The contagion is probably chiefly effected through direct or mediate inoculation.

Pathology.—The disease consists of a deposit of cells in the corium and subcutaneous tissue, similar to those seen in lupus and syphilis. The specific bacillus is found in the tubercles, infiltrations, lymphatic glands, nerves, etc.

Diagnosis.—Advanced cases of leprosy are easily recognized. The disease may be confounded with syphilis, morphea, vitiligo, and lupus. The occurrence of anesthesia and the history and course of the disease will usually enable one to make the diagnosis. In doubtful cases the microscope should be resorted to, with the view of discovering the bacilli in the affected tissues. The Wassermann reaction seems as successful in leprosy as in syphilis.

Prognosis.—Always unfavorable. The disease progresses, with rare exceptions, to a fatal termination. The course is more rapid in the tubercular than in the anesthetic form.

Treatment.—Nutritious food, good hygiene, and removal to a healthful climate are important therapeutic measures.

The remedies which have proved most valuable in the treatment of leprosy are chaulmoogra oil (best in the form of antileprol, it is claimed) and gurjun oil, used both internally and externally in the tubercular variety, and strychnin in large doses in the anesthetic form. Nastin and eucalyptus are advised. X-ray treatment has apparently resulted in cures.

LEPTANDRA (Culver's-root).—The rhizome and rootlets of *Leptandra virginica*, now called *Veronica virginica*. Its properties are thought to be due to a glucosid, *leptandrin* (dose, 2 to 4 grains). It is a tonic, laxative, and cholagog, and is indicated in indigestion and chronic constipation. Dose of the extract, 1 to 6 grains; of the fluidextract, 10 to 20 minims.

LEPTOMENINGITIS.—Inflammation of the pia and arachnoid of the brain and the spinal cord, in contradistinction to pachymeningitis, though meningitis alone usually signifies the same as leptomeningitis. See MENINGITIS.

LEUKANEMIA.—A term applied by von Leube to an acute condition of leukemia combined with severe anemia. It is usually fatal in from a few days to three months. The onset may be sudden with fever and severe tonsillitis, prostration, hemorrhage, extreme pallor and rapid decline. There is often general glandular enlargement including the liver and spleen. The reduction of hemoglobin and erythrocytes with increase of lymphocytes (usually the large form) is conspicuous. The red cells may be as low as 1,500,000. The color index is high.

LEUKEMIA (Leukocythemia).—A chronic disease of the blood-making organs, characterized by great and persistent increase of the white blood-corpuscles; by a diminished number of red cells, which are altered in shape and size, and display nucleated and degenerate forms; by a lessened amount of hemoglobin; and by enlargement of the spleen, lymphatic glands, or medulla of bone (Musser).

Etiology.—The disease may occur at any period of life, but is seen mostly in adult males. Syphilis, splenic traumatism, pregnancy, heredity, malaria, bad hygiene, and repeated hemorrhages may act as predisposing causes. It has been held to be due to the absorption of toxic substances from the digestive tract. It seems probable that it is of infectious origin.

Pathology.—There may be great emaciation. The spleen is usually enlarged. The cervical, inguinal, and axillary glands may be the first to enlarge. The liver may be enormously enlarged.

There is extensive hyperplasia of the lymphatic tissues and reversion of the bone-marrow to the embryonal type.

Symptoms and Course.—By examining the blood we detect 2 varieties of leukemia: (1) Splenic myelogenous leukemia; (2) lymphatic leukemia. Mixed splenic and medullary leukemias are the most common—called splenomedullary (lienomedullary) or lienomyelogenic.

Splenic Myelogenous Leukemia.—The colorless corpuscles are greatly increased, but there may be only a small diminution in the number of the red cells, averaging slightly above 3,000,000, with a small decrease of the hemoglobin. Nucleated red cells are present in abundance. Eosinophiles and basophilic leukocytes are markedly increased.

Characteristic of this form of leukemia is the large corpuscle—the *myelocyte*, a large cell with a large, pale blue nucleus, and not ameboid. The great number of these myelocytes present is diagnostic of this form of leukemia. With the decided increase in the number of these myelocytes there is a corresponding diminution in the lymphocytes (youngest leukocytes).

Lymphatic Leukemia.—This is characterized by enlargement of the lymphatic glands and an absolute lymphocytosis. In this form (about 15 percent of all cases) there is a greater reduction in the number of red cells than in the splenic myelogenous form, but there is almost an absence of the nucleated red cells, in contrast with the splenic variety of leukemia. With this reduction of the red cells there is a greatly increased number of the leukocytes (though less so than in the splenomyelogenous form) especially the lymphocytes, which may constitute 90 percent of the white corpuscles. These lymphocytes are of all sizes.

The leading characteristics of leukemic blood are:

Splenomedullary leukemia	1. Red cells reduced to greater or less degree (at times below 1,000,000), numerous nucleated forms. 2. White cells about 400,000, of which— 3. Myelocytes form about 35 percent.

Lymphatic leukemia.	1. Red cells about 3,000,000 or lower, nucleated forms rare. 2 White cells 100,000 or lower, of which— 3. Lymphocytes form 90 percent, either large or small predominating. 4. Myelocytes and eosinophiles very scanty.

Symptoms.—At first the symptoms are those of the other anemias: Insidious onset, pallor, faintness, vertigo, dyspnea, weakness, anorexia, indigestion, headache, palpitation. Hemorrhages are common. Enlargement of the spleen or lymphatic glands or both are found. There may be moderate fever. The enlarged glands are free from active inflammation and give rise to pressure symptoms. There is a tendency to serous effusions in the later stages and emaciation appears. The pulse is rapid and easily compressible. Nausea and vomiting are common. The urine usually contains an increased amount of uric acid.

Diagnosis can only be made by the blood examination. See Blood, Diagnosis of Leukemia.

Prognosis is usually unfavorable. The lymphatic form may be fatal in from 6 weeks to 2 months.

Treatment.—The best hygienic surroundings possible should be given the patient, and good, nutritious food supplied. The patient should never exhaust himself by too active exercise. If there is a history of malaria, quinin in 3- or 4-grain doses should be given 3 times daily. Arsenic is highly recommended, and any prescription recommended for pernicious anemia may be given. Benefit has been derived, it is claimed, from X-ray treatment by the Pancoast method (exposure consecutively of the various bone-marrow regions of the body). In the splenomyelogenous type remarkable results have been obtained from the use of the X-rays. Some improvement is reported in cases of the myeloid type from the use of mixed toxins of streptococcus and B. prodigiosus. See Anemia (Pernicious); Blood (Examination).

LEUKOCYTE EXTRACT.—According to Hiss, an aqueous extract of washed leukocytes, obtained from healthy rabbits after an injection of aleuronat into the pleural cavity, has a curative action when injected in infectious diseases. Satisfactory results have been obtained in pneumonia, furunculosis, erysipelas and cerebrospinal meningitis.

LEUKOCYTOSIS.—See Blood (Examination).

LEUKODERMA.—Leukasmus; achroma cutis; leukopathy. A congenital pigment anomaly of the skin, in which, at the time of birth or soon after, whitish patches or bands, irregularly outlined and usually isolated, appear upon the skin of the child. See Vitiligo.

LEUKOMA.—An opacity of the cornea the result of an ulcer, wound, or inflammation, and presenting an appearance of ground glass. See Cornea.

LEUKOMAIN.—The name applied by Gautier to the nitrogenous bases or alkaloids necessarily and normally developed by the vital functions or metabolic activity of living organisms, as distinguished from the alkaloids developed in dead bodies, and called by Selmi ptomains. See Ptomain, Autointoxication. From their chemic affinities leukomains may be divided into two groups: The *xanthin group*, comprising xanthin, adenin, carnin, gerontin, guanin, heteroxanthin, hypoxanthin, paraxanthin, pseudoxanthin, spermin, and the *creatinin group*, in which are classed creatin, creatinin, amphicreatinin, crusocreatinin, xanthocreatinin, and some unnamed bases.

LEUKOPENIA (Hypoleukocytosis).—See Blood.

LEUKOPLAKIA.—See Tongue.

LEUKORRHEA.—A whitish mucopurulent discharge from the female genital canal, popularly called "the whites." See Cervix (Diseases), Gonorrhea, Vaginitis, Vulva.

LICE.—See Pediculosis.

LICHEN RUBER.—An inflammatory disease characterized by the appearance of small, flat, angular, and shining or discrete, acuminated and scaly, reddish papules, running a chronic course and attended by more or less itching.

Symptoms.—There are 2 varieties: Lichen ruber acuminatus and lichen ruber planus. Some authors regard these forms as distinct diseases.

Lichen Ruber Acuminatus (Lichen Ruber).—This is a very rare disease, particularly in America. It is characterized by discrete, millet-seed sized, acuminated, scaly, reddish papules, which are disseminated over the trunk with no disposition to grouping. After a duration of years the skin may become diffusely infiltrated, reddened, and scaly. There is mild or severe itching present. The disease is extremely chronic, usually compromising the general health, and tending ultimately to a fatal termination.

Lichen Ruber Planus (Lichen Planus).—Lichen planus is not an uncommon disease. It may develop gradually or rapidly, appearing as pin-head-sized to pea-sized flat, quadrangular, or polygonal, shining, slightly umbilicated papules of a violaceous or reddish color. The lesions may be disseminated, but are more commonly closely aggregated in patches, which assume frequently a linear form. The surface of the papule is at first glazed or shining, later covered with fine whitish scales. The favorite regions are the flexor surfaces of the forearm and wrist and the dorsal surfaces of the feet. When occurring upon the legs, the papules are apt to become confluent, with the formation of elevated plaques of a purplish color. A brownish pigmentation often persists after the disappearance of the lesions.

Itching is, in the majority of cases, a prominent symptom. The general health remains unaffected.

Etiology.—The disease is of neurotic origin. The most common cause is nervous exhaustion resulting from worry, overwork, etc. It is most frequently observed in middle-aged individuals.

Pathology.—The pathologic process in the plane variety consists of a dilatation of the papillary blood-vessels, a dense, sharply circumscribed round-cell infiltration in the upper part of the corium, proliferation of the cells of the rete mucosum, with either flattening or elongation of the papillæ. The papules are claimed by some to develop at the sites of hair follicles; by others, around the sweatducts.

Diagnosis.—The characteristic features of the papules of lichen planus are their angularity, flatness, shining surface, violaceous color, and umbilication. These points will differentiate the disease from papular eczema, psoriasis, and the papular syphilid. The papules of eczema are rounded, somewhat acuminate, brighter red in color, and have a different history.

Prognosis.—The prognosis of the acuminate variety is extremely guarded; of the plane variety, favorable.

Treatment.—The treatment is both general and local. Attention to diet and hygiene should not be neglected.. Cod-liver oil, iron, strychnin, etc., are often indicated. Arsenic is by far the most valuable remedy, exerting almost a specific influence upon the disease. In some cases, particularly when arsenic fails, mercury acts most favorably.

Locally, applications containing tar, phenol, menthol, salicylic acid, mercury, etc., are to be employed. The following formula, suggested by Unna, has been successfully used:

℞.	Carbolic acid,	gr. x to xx
	Mercuric chlorid,	gr. ij to iv
	Zinc oxid ointment,	ʒ j.

Apply twice a day.

LICORICE.—See Glycyrrhiza.

LIFE ASSURANCE EXAMINATION. General Remarks.—Life assurance is a contract by which a corporation agrees to pay a stipulated sum, such as may be agreed upon between the parties, either on the death of the life assured or within a limited number of years, as the case may be, provided the applicant fulfils his part of the contract. The latter consists in the regular payment of fixed sums, known as premiums. Before a company will enter into such a contract it usually requires the recommendation of at least two medical officers of the company—the one the local examiner, to whom the applicant submits for medical examination as to his present state of health, and to whom also he must furnish a truthful report of his past ailments, as well as data with regard to his family history; the other, the medical director, or chief medical officer, whose duty it is to examine carefully this report and advise the company as to the desirability of accepting the risk.

Of late years the amount of money involved in these contracts has reached enormous dimensions. The financial standing and the success of all companies depend to so large an extent on the judicious report as to the past and present state of health of the applicant, as well also as the moral hazard of the risk, that it is necessary that the medical inspection and supervision of each individual risk should be made with great care.

The first important point it is desirable for the medical examiner to remember is that all assurance companies base their premiums on the assumption that their assured lives shall be healthy individuals of healthy families: *i. e.*, not only must the applicant for assurance be himself free from disease and of good habits, but he must also belong to a family of healthy brothers and sisters (if he has any), children of healthy parents.

With such a history, the average duration of life at all ages has been estimated by actuaries of several companies, who have varied but a few months as to its duration at the different ages; that is to say, as to the number of years longer which a healthy person, as above stated, of a certain age, is expected to live. This is what they call their "expectation." The rates of assurance for first-class lives are fixed accordingly. See Life (Expectation).

The "selection" of the risk is the duty of the medical board, which may consist of one or more "medical directors," so called because they direct the medical affairs of the company. Most English companies have but one such officer, whom they call the "medical referee" or "chief medical officer."

It is the duty of these officers to examine the medical reports of all examinations and to eliminate the objectionable risks. Many cases are rejected by medical directors because of features which their greater experience leads them to believe are hazardous, although recommended as first class by medical examiners.

In other cases, although they may consider the risk not a safe one on a cheap plan, they may think it assurable on some plan with large annual payments, and offer a policy on an endowment plan or some plan more favorable to the company than the one applied for. If the applicant will not accept this policy, the risk will be completely declined and placed on the black-list.

The medical examiner who has examined the applicant may consider him an unobjectionable risk because at the time of examination he is perfectly healthy, but the medical director, in reviewing the whole history of the case and acting upon the statistics furnished by the actuarial department, as well as his own observation in examining death claims, may, and very frequently does, feel compelled, acting in the interest of the company, to reject the risk, notwithstanding the favorable recommendation of the examiner. The objectionable features in the case may have been only an incomplete family history and light weight compared with height.

The decision of the medical board may or may not be referred to the executive, or board of directors (not medical). They nearly always follow the recommendation of the medical board, but, of course, may do otherwise, if they so decide. To be binding, the policy must have the signature of the executive.

All appointments of medical examiners are made by the medical board or medical director. Some companies have a "medical referee," to whom all applications for appointment as examiner are sent. With some companies the medical referee acts as medical inspector, whose duty it is to visit the various agencies and acquire information as to the standing of the various medical examiners. He also occasionally is called upon to investigate the circumstances connected with death claims in the previous history of which there may be some unsatisfactory points to be explained.

No applicant who at the time of examination is suffering from disease in any form should be accepted at that time. Many, also, who are quite free from present disease must be considered bad or impaired risks. These, however, are usually insurable, but at rates and on plans varying with the nature of the impairment. With some this impairment is likely to diminish as they grow older, while with others the contrary is the case; hence we have those who may be classed as lives with "diminishing risks," and also lives with "increasing risks."

Gout, arteriosclerosis, and consequences—diseases more frequently found after middle life—are examples of the latter class. In the former a tendency to tuberculosis, especially of the lungs, may be included, inasmuch as the liability lessens as the individual grows older. Assurance companies take different measures to meet these various risks. Some, more especially the British, impose in nearly all cases an addition of a certain number of years to the age of the applicant, thus increasing the amount of premium required. Others, particularly American officers, offer the applicant an "endowment" policy, on the theory that the extra risk is overcome by shortening the term of the policy and exacting a correspondingly heavier premium. Either of these plans may be comparatively safe for cases of "increasing risks," but they can hardly be considered as based on sound actuarial principles when applied to the case of "diminishing risks."

It is the practice of some companies to place a "gradually reducing lien" or "contingent debt" on the policy issued on such a life. Both the amount of the lien and the duration of its existence vary according to the nature of the risk, and many authorities consider that this is a more correct method of dealing with such cases.

Duties of Medical Examiner.—The medical examiner must always remember that he is the official representative of the company, and that he acts purely in its interests. Whenever there is any doubt as to the advisability of accepting the risk as a first-class one, it is his duty to give the company the benefit of that doubt. Under no circumstances should he allow himself to be influenced, either by agent or applicant, in suppressing any information in regard to family or personal history. Illness of any kind for which the applicant may have consulted a physician, especially if within the last few years, should be fully reported on, both as to its nature, the length of the confinement to bed and to the house, and any other information of importance in connection with it. Before a policy will be issued the medical board must have full particulars of the past medical history of the applicant, to enable them to form an opinion of the value of the risk, quite independent of the medical examiner's views. It may not always be advisable for the medical examiner to put in writing on a printed form his opinion, especially as to habits, if they are objectionable. They will be sure to be read over by the agent, and probably related to applicant. This difficulty can be readily overcome by the medical examiner writing a confidential letter to the medical director giving more complete information as to any unfavorable point in either personal or family history.

In proceeding to examine the applicant the medical examiner should remember that he must do so with as much care as he would were it an ordinary office connection on the applicant's behalf, according to the printed form of the company. There are a number of questions he is expected to ask, both with regard to the family and also the personal history. The replies to these questions he must write down. Now, for this purpose it is advisable to have the applicant so placed in front of the light that, while getting the replies to the various questions, he may study his appearance, and thus form a general idea as to his age, general health, and prospects of longevity. A good rule is to commence these questions by asking the applicant if he has ever been refused by any company, and also if every company to whom he has applied has issued a policy on the plan applied for. The reason of this is that it is almost of daily occurrence in companies doing a large business to find that as soon as the agent who has canvassed the risk has the slightest hint that the applicant is not a first-class life, and probably because of conscientiously believing the examiner to have been unnecessarily strict, he will at once take the man to another company in the hope that its medical representative may not be so particular. Unfortunately, it often happens that through a hasty and incomplete examination the second doctor may overlook a slight heart murmur or some other feature recognized by the first examiner, and advise issuing a policy, with the consequence that his own services may, quite possibly, be dispensed with. This happens in this way: So soon as a risk is declined, notice of this refusal is sent to a central bureau, and from there a printed card is posted to all the companies who are members of the "exchange." The cards thus received are kept on file in cabinets. Before a policy can issue from the office every name that has been recommended for assurance is searched for in these cabinets, and if found in this black-list, information is obtained as to the reason why the previous company did not issue its policy. In this way many a fraud on the part of the applicant (who has denied previous refusal) and many an error on the part of the physician have been discovered.

At the same time it must be remembered that the denial by the applicant of his refusal by another assurance company does not always mean fraud. He may be, and very often is, in ignorance of the reasons of the policy not having been issued.

In making this examination there are four distinct points which should carefully be inquired into by the medical examiner and reported upon:

1. Family history.
2. Past medical history.
3. Past and present habits.
4. Present state of health as indicated by medical examination.

In reporting upon all the above the medical examiner must not lose sight of the fact, already referred to, that he is examining in the interest of the company he represents. With that in view, he should be on his guard as to the possibility of the applicant concealing information connected with family or personal history which might influence the decision of the company as to issuing a policy. That concealment may be intentional or otherwise. Should a death claim arise within 3 or 4 years, notwithstanding the false statements made, the company is barred by the laws of many states from making this a point in the defense, unless it can be proved that this statement was fraudulently made and had a direct bearing on the cause of death. Nowadays most companies voluntarily adopt a limited period (generally 2 or 3 years) after which time the policy is absolutely indisputable, notwithstanding any misstatements.

Family History.—Taking up, now, the first of the headings above referred to—the family history—the replies to the questions as written down by the medical examiner are very frequently the cause of much inconvenience and delay in issuing a policy. In the case of death of either parent or other member of the family, the terms "general debility," "anemia," "la grippe," "burst a blood-vessel," "hemorrhage," or, in the case of sisters or mother, the terms "change of life" or "childbirth," are often used without any explanatory notes as to the duration of illness or presence or absence of cough. The experience of all medical directors shows that these terms are frequently made use of when the actual cause of death has been **tuberculosis** of the lungs. Many an applicant quite conscientiously gives "childbirth" as cause of death of mother or sister, believing it to have been the direct existing cause of the diseased condition, which may have terminated in death a few months after delivery. In view of this tendency on the part of the public in the absence of such definite information as will satisfy the medical director that tubercular disease may be completely eliminated, he will not be justified in treating the case as an unimpaired life, unless, indeed, there are other features of a personal character, which in his opinion may offset these unfavorable points.

The mortality from tuberculosis is so great that when indefinite statements are made regarding family history, suspicion is naturally directed that way. Hence the absolute necessity arises of the medical examiner furnishing such complete and detailed information as will enable the medical director to form an accurate opinion as to the facts of each case.

Other indefinite terms are occasionally made use of by inexperienced medical examiners, such as "dropsy" (a mere symptom of a diseased condition of some organ, such as heart, kidney, or liver), "heart failure," "dissipation," "congestive chill." All such cases require full inquiry and explanation.

When either parent has died of consumption, it is particularly desirable that inquiries should be made as to the cause of death (if any deaths) of other members of deceased's family, so as to be able to eliminate any chronic lung trouble, for, indeed, in an insurance point of view, the company should take the benefit of any doubt that may exist, and assume that every suspicious case is one of tuberculosis.

Seeing that consumption accounts for the largest number of death claims in the mortuary list of all assurance companies, it is one which, naturally, the medical department tries most to guard against. There is little doubt that some of these claims are avoidable. With our more modern views of the nature of the disease, and its manner of transmission, the question of heredity loses some importance. Although an important factor, the environment, occupation, and physique of the applicant are of even greater importance. As a rule, however, the progeny of strong and healthy parents possess more endurance, and are less susceptible to contagious diseases, other things being equal, than those of feeble parents. Therefore, when exposed to the contagion, the latter are less liable to resist the attack of the bacilli.

It is a debatable question in the case of either parent dying of consumption at an age when the children are very young, whether such a risk should be considered more or less hazardous on the part of the children subsequently seeking assurance. In favor of the latter view may be stated that they are exposed to the contagion at a time—early childhood—when the individual has great resisting powers to that disease. Later on, when developing into men and women, the danger of contracting the disease is greater should they be exposed to the contagion. On the other hand, it should not be lost sight of that if either parent died within a very short period of the birth of the child seeking assurance, there is a probability of that child inheriting, to some extent at least, the impaired vitality of the parent.

Living in the same house, especially sleeping in one, in which an individual has recently died from consumption, or is suffering from it, neutralises to a certain extent the favorable importance of a first-class personal physique, and even of over average weight. This is especially the case in regard to man and wife, so that with young married men the fact of the wife suffering from the disease or from any chronic lung trouble which would give reason for suspecting consumption, seriously impairs the life of the husband, so far as assurance is concerned.

Arteriosclerosis and its resultant affections of the system, such as some forms of **kidney-disease, apoplexy,** and the like, if the cause of 2 or more deaths in a family, should be considered as placing an applicant in the under average class, especially if associated with even a moderately free use of alcohol. Many of these causes are really the result of a "gouty" condition, and if death of either parent can be assigned to that cause, the risk is rendered more hazardous, as we have unfortunately many evidences of its hereditary nature.

When such a family history is present, it is the duty of the medical examiner to inquire minutely into the personal history of the applicant for any evidences of a similar condition, such as frequently occurring attacks of tonsillitis, bronchitis, and eczema. These remarks apply more to individuals over 45 years of age, and with almost equal emphasis in a family and personal history of rheumatism.

Past Medical History of the Applicant.—Naturally, this has an important bearing on the desirability of the company assuming the risk. Again, we think of the dreaded disease **consumption,** and cannot help observing in private and hospital practice that the frequent occurrence of catarrhal conditions in an individual who is the offspring of tubercular parents makes him a particularly hazardous risk, although at time of examination he may appear to be perfectly sound.

No less important is the history of the occurrence of **pleurisy** within recent years. The examiner should be most careful in making the examination. He may be able to locate where the pleuritic condition existed, but if the history of the case pointed to the probability of its being toward the apex of the lung and of recent date, the risk should be considered an impaired life. If a history of tuberculosis is present in the family, and the applicant is below the average weight, the risk should not be accepted at ordinary rates. A death in the family from pleurisy should be looked upon with suspicion as possibly being associated with tuberculosis.

The view too often entertained that a history of pleurisy in an applicant is of very little consequence is a grievous error. In recorded cases in which death has occurred from this disease and postmortem examinations have been made, nearly 50 percent have been tuberculous. Of those who have recovered from the attack almost one-fourth subsequently developed tuberculous disease of the lungs. In cases in which the disease has lasted any length of time fully 50 percent die of tuberculosis.

Hemoptysis, if within recent years, should certainly be considered sufficient grounds for refusing a risk. There are good reasons for believing that it may occur without tuberculous disease, but the cases of that kind are so very rare that for assurance views it is safe to look upon all such as tubercular. If an applicant has been in perfect health since the attack, and has increased in weight so that he is above the average weight for his height, and an interval of 8 or 10 years has elapsed since the hemoptysis, the risk may be considered fairly safe, but he cannot be a first-class life. He is safely assurable on some plan, such as an endowment, or with a small lien placed on the policy.

Cancer is a disease about which there appears to be but little unanimity in practice among companies with regard to the acceptance of those risks. There can be little doubt that the relative number of deaths from cancer is greater now than it was many years ago. This can, however, be readily accounted for by the fact that the mortality of the younger ages is very much less than formerly—that is to say, that more individuals survive to the ages at which cancer makes its appearance. The practice of some companies in disregarding a single death from cancer in the family history seems to be justified by mortality lists. Two or more deaths in the family from any cancerous affections are, however, sufficient to cause a life to be treated as impaired.

Diseases of the Genitourinary Tract.—An applicant suffering from an attack of gonorrhea should be put off until some time after the disease has been fully cured. It may result in a stricture which in late years (through secondary diseased conditions) may endanger life. Stricture, if obstinate and not readily and quickly yielding to treatment, may cause secondary diseased conditions, such as pyelitis or disease of the bladder or kidneys of a more chronic form. Such troubles may arise from an apparently insignificant stricture. Such an applicant should not be considered first class. Some years should be taken off his "expectation" and the premium increased accordingly, or a policy on a short term endowment only granted.

Syphilis.—That individuals may die of syphilis can be easily proved by referring to the pathologic museum of any hospital or school of medicine, and that many of them may die at periods remote from the primary inoculation, clinical history will attest. For these reasons a man who has had syphilis, although reported cured, cannot be considered a "selected" life. The practice of assurance companies varies with regard to such lives. Many companies will issue any form of policy provided a certain time, say 3 years, has elapsed since final disappearance of symptoms, more especially if they have had several months' treatment. Others again will issue only a limited policy, say 20-year endowment, without any extra premium. When an applicant has had syphilis and has undergone a regular course of medical treatment for say 3 years, and the individual has a healthy appearance and leads a regular life, and if at all uses alcohol only very moderately, the risk is considered by many companies as presenting no objections to being first class. Other companies again will demand an extra premium corresponding to that caused by the addition of 6 or 7 years to the age of the applicant. Still others again impose a lien running off in 15 or 20 years.

It must not be overlooked that many, even of the so-called cured, patients, may die 15 or 20 years after the infection from some such disease or locomotor ataxia or some affection of the brain, while others succumb at earlier periods from syphilitic affection of the lungs, kidneys, liver, etc.

Albuminuria is a condition regarding which there appears to be an utter absence of unanimity of action on the part of the medical boards of the various companies. All medical authorities are fully agreed that the presence of albuminuria in a young person is not incompatible with perfect health.

Many individuals in whom albuminuria is present, and who were declined for assurance—some as far back as 27 years ago—have during that time enjoyed the best of health. On the other hand, cases are so numerous in which the detection of albuminuria has been followed by so limited a term of existence, even in the young, that its presence at the time of examination should be sufficient to postpone the acceptance of the risk until such time as it can be reported that frequent examinations within some definite time have proved the absence of albumin.

Should an examiner meet with such cases, he should make a most careful examination of the **heart-sounds**, especially in the aortic region, so as to be able to include that very important indication of arterial changes, the accentuated second sound, and report in full all the facts.

Otorrhea is a condition which should be inquired into if present. It may be of little consequence, but as many of those in whom this condition is present die from the extension of the disease, as a result of septic infection or of inflammatory affection of the brain or its membranes, the life cannot be considered otherwise than as impaired. By the term otorrhea we understand a chronic suppurative inflammation of the middle ear. It is frequently a sequence of either measles or scarlet fever, but it may follow an acute inflammatory affection, as a result of cold in a person with scrofulous tendency. The mastoid cells may become involved and place the life of the individual in jeopardy. Even in cases in which the discharge has ceased for a time a slight existing cause may give rise to inflammatory processes which, by extension, may cause alarming cerebral symptoms.

In cases of this kind the examiner should elicit from the applicant the duration of the discharge, and, if it has now ceased, the time of its disappearance. He should also endeavor to find out whether or not it followed any of the eruptive diseases. All these facts should be fully explained in the medical report.

The actual presence of a discharge is not enough to cause rejection of the risk. Some companies may accept on a short term endowment, while others may place a small lien on the policy, running off in say 15 years; while others may meet the extra risk by charging a higher premium, resulting from adding an extra 7 years to the age.

Inflammation of the bowels, in the past history of an applicant, is a term about which examiners are very often not sufficiently accurate in their reports. When given as one of the ailments for which he has had medical care, the date of the occurrence and duration of illness should be fully reported. The medical examiner should get from the applicant a description of symptoms from which he suffered, and report accordingly. Without a detailed or satisfactory report the medical director will be in duty bound to accept the views of most physicians and surgeons, who look upon the great majority of such inflammatory cases as attacks of appendicitis, which, if recent, are so liable to recur. There can be no doubt that often when the applicant reports that he has had inflammation of the bowels it may have been only some catarrhal trouble, or an attack of enteritis, or a mild attack of dysentery. Should there be no satisfactory evidence, so far as the report goes, that the attack was not appendicitis, and if it occurred recently, say within from 3 to 5 years, the medical director will probably take the benefit of the doubt, and postpone the acceptance of the risk for a limited time after its occurrence (3 to 5 years generally), or advise issuing a policy only on some heavier payment plan, or its equivalent.

A perfect cure after removal of the appendix renders the risk unobjectionable on the ground of a previous appendicitis.

Habits.—The abuse of alcohol in its various forms is a source of great trouble to assurance companies. In the first place, a very large proportion of death claims are either directly or indirectly due to it. Most physicians agree that its very moderate use may cause no injurious effect on the health of the individual. All men know that its excessive use is decidedly injurious. It is an extremely difficult matter to decide as to the dividing line between the two conditions. It can be safely assumed that the man who uses over, say, 2 or 3 ounces of spirit or its equivalent a day, is producing injurious structural changes in his vascular system. But few individuals admit the full quantity taken daily. The facts tend to prove that the offspring of neurotic parents, when users of alcohol, are more prone to its excessive use. In estimating, on this ground, the value of a life seeking assurance, heredity should be considered. One who uses alcohol freely in any form, either of whose parents were addicted to its use, must be considered a very hazardous risk.

When any doubt exists, the company should unquestionably take the benefit of that doubt either by not assuming the risk or by issuing a policy on some short term plan, with heavy payments, such as a 10-year or 15-year endowment, or, again, by adding 7 or 10 years to the age with correspondingly increased premium.

Medical Examination of the Applicant.—By the time the medical examiner has completed his questions and noted down the replies thereto, he will have formed a fair idea of the nature of the risk his company is asked to assume. He will have observed the man's **general appearance**—whether anemic or plethoric—by the general appearance of face and ears, as well as the character of his breathing, whether or not there is a probable tendency to tubercular disease. At the same time he will have given the applicant a chance to overcome that nervousness so often met with in applicants for assurance, when knowing they have to undergo medical inspection. When possible, in fact in all cases, the **chest** should be uncovered so that an inspection, as well as a proper stethoscopic examination, may be made. Very often the **inspection** will reveal the scars of croton oil, which tell a tale of previous lung trouble. Without the naked chest examination it is impossible to say whether one-sided subclavicular depression is present or not. If present, it may indicate a scarred and contracted lung in which disease is only temporarily in abeyance, or it may point to a permanently collapsed lung as the result of an old pleuritic effusion. These conditions are so often present in those seeking assurance, and, when present, so frequently indicate an impaired life, that it should be strongly impressed upon all medical examiners that if they omit this necessary inspection of the chest, they are neglecting an important duty devolving on them as the medical representative of the company.

Having made the inspection, the examiner should proceed to **percussion,** not omitting the area of cardiac dulness, having done which he should now make the necessary **auscultation of the heart and lungs** and report their condition. When any abnormal condition is present, it should be noted. In auscultating the heart any such, of course, must be stated in the report; in the case of murmurs, their locality should be clearly designated, as some companies which accept impaired lives, while completely declining to accept a case of aortic regurgitant murmur, may accept one with a mitral murmur on some protecting plan. Any murmur, no matter how slight, provided it is constantly present with each impulse of the heart, should be reported. Clinical experience teaches us that the gravest disease of the heart may be present with only a very soft murmur. There is another point of great importance, and one which, if carefully examined for, and, when present, reported upon, would very often save companies heavy death claims. This is the accentuation of the second sound in the aortic region. It nearly always means peripheral vascular changes. It is particularly to be dreaded when there is a family history of apoplexy or kidney-disease, as there are grounds for suspecting the probability of hereditary tendency to the same vascular changes that may have caused these deaths. Clinical experience certainly supports that belief. The occupation of the applicant, if one in which there is continuous mental strain or vascular excitement, may be considered as a very important factor in that same degenerative change. It is an interesting fact that in the experience of many large companies cerebral affections are responsible for a greater percentage of mortality among those who are able financially, and who assure for amounts above $5000, while diseases of the respiratory system cause more death claims among those who assure for smaller amounts.

The weight is of great importance from a life assurance point of view. The applicant should, if possible, be weighed at the time of examination. All above maximum or below minimum weight for their height (with certain exceptions) are considered impaired risks. The exceptions would be when diminished or excessive weight is a family characteristic, associated with longevity. Thus, if the applicant is considerably above the average weight, and one or more brothers or sisters are the same, and either parent is alive in advanced years, and of the same physique, these characteristics would considerably modify the bad qualities due to weight. With a slight history of tuberculosis in the family, an applicant considerably above average weight, and quite healthy otherwise, the risk might be considered a fair one.

A large American life assurance company made a special investigation into the mortality among its members who were considerably over the average weight at the time of assurance. Those whose parents were stated in the application to be still living, or, if dead, to have died at over 70 years of age, showed an excellent mortality record; while those either of whose parents had died before 70, showed a very heavy death-rate.

Diabetes, when known to be present, is certainly a bar to assurance. It is quite possible for an individual to have **glycosuria** of a temporary character, due probably to some gouty condition in an individual with a tendency to obesity. Such a state may be present without the more serious symptoms of diabetes, and when cured after an interval of time, the individual may be assurable as an impaired risk with extra premium. During this interval the urine should be examined several times, with a report of such a character as to show that the condition could only have been a temporary one, and that it has been perfectly normal for many months. The persistent or repeated presence of sugar, or the necessity for an antidiabetic diet should disqualify for assurance on any terms.

Women in Life Assurance.—A very important point to remember in considering women in life assurance is the fact that the mortality among assured women is much greater than among those who are uninsured—the latter compare very favorably with men. There must be some reason for the unfavorable comparison. It may be accounted for by the fact that many of the cases are of a purely speculative character. A large proportion of the assured are married women, who have not been in very good health, and are easily persuaded by their husbands to apply for policies. Naturally, the medical examiner does not like to subject them to the same scrutinizing examination that he should in the case of men. By his omission to do so a soft cardiac murmur or incipient tubercular disease of the lungs may readily escape observation, or, again, a woman approaching the menopause may attach no importance to indications of commencing uterine disease, and report herself as being quite healthy, in reply to the usual questions. It is advisable, when examining married women and writing down the replies to questions, to inquire if the husband is assured. Should such not be the case, the interrogatories should be more searching, in order to ascertain if she is concealing information regarding previous consultations with medical men, or any other matters with respect to her health about which she may be uneasy.

If assurance were as common among women as it is among men, there can be little doubt they would prove more profitable risks for the companies. According to statistics, fewer females die annually than males; the average duration of life is slightly longer. It is quite true the mortality from phthisis is greater among them than in males; more also die from cancer; and to both these frequent causes of death must be added the risk of childbirth. Now that outdoor sports, such as bicycling, golf, etc., are becoming more general, sunshine and fresh air are already helping to diminish the relative mortality from tuberculosis among women, while among men death from accident and alcoholism are on the increase.

Identification.—Fraud in many ways is continually being attempted on companies. False statements of all kinds, as well as suppression of important facts in family as well as in personal history, are of daily occurrence. Unfortunately, fraud of a more criminal character, such as impersonation, is not infrequent. A healthy individual of similar physique to one suffering from some fatal disease may present himself for examination and be favorably reported upon. Height, color of eyes and hair, as well as a description of marks, such as moles or deformities, may to some extent avoid some of these.

It is also advisable in every case to have the applicant sign his name at the time of examination, and in presence of the medical examiner, this signature being altogether independent of that in application for assurance.

Tropical Risks.—Recent arrivals in tropical climates are much more hazardous risks than those who have been living there for several years; so also are young lives more hazardous than their seniors. A healthy man of over 30, leaving a temperate climate for a hot one, is not so hazardous a risk as one say between 18 and 25; the latter is much more liable to die from dysentery, malaria, etc. Extra rates should be charged, varying with the age of the individual and its corresponding extra risk.

Among the many **occupations that tend to shorten life** we must include those who are engaged actively in stock-exchange transactions. The constant excitement and continuous mental strain and worry has an injurious effect, often shown by changes in the vascular system and their secondary effects either in brain or kidneys.

LIFE, EXPECTATION.—The average number of years a person is expected to live, as calculated from life-tables. Below is the "Actuaries' or Combined Experience Table of Mortality" as given by Greene.

LIGATURE.—A cord or thread of any material for tying arteries, etc.

Arterial hemorrhage is best arrested by simple ligation, and a ligature is occasionally required in venous bleeding. It is best to include as little of the surrounding tissues as possible in employing a ligature, except when arterial coats are diseased. In ovariotomy the pedicle is included in the ligature with the vessels *en masse*. Hemorrhoids and nævi may be treated by ligature. Silk linen thread, silkworm-gut, kangaroo tendon

AGE.	NUMBER LIVING.	NUMBER DYING.	YEARLY PROBABILITY OF DYING.	EXPECTATION OF LIFE.
10	100,000	676	0.006760	48.36
11	99,324	674	0.006786	47.68
12	98,650	672	0.006812	47.01
13	97,978	671	0.006848	46.33
14	97,307	671	0.006896	45.64
15	96,636	671	0.006943	44.96
16	95,965	672	0.007003	44.27
17	95,293	673	0.007062	43.58
18	94,620	675	0.007134	42.88
19	93,945	677	0.007206	42.19
20	93,268	680	0.007291	41.49
21	92,588	683	0.007377	40.79
22	91,905	686	0.007464	40.09
23	91,219	690	0.007564	39.39
24	90,529	694	0.007666	38.68
25	89,835	698	0.007770	37.98
26	89,137	703	0.007887	37.27
27	88,434	708	0.008006	36.56
28	87,726	714	0.008139	35.86
29	87,012	720	0.008275	35.15
30	86,292	727	0.008425	34.43
31	85,565	734	0.008578	33.72
32	84,831	742	0.008747	33.01
33	84,089	750	0.008919	32.30
34	83,339	758	0.009095	31.58
35	82,581	767	0.009288	30.87
36	81,814	776	0.009485	30.15
37	81,038	785	0.009687	29.44
38	80,253	795	0.009906	28.72
39	79,458	805	0.010131	28.00
40	78,653	815	0.010362	27.28
41	77,838	826	0.010612	26.56
42	77,012	839	0.010894	25.84
43	76,173	857	0.011251	25.12
44	75,316	881	0.011697	24.40
45	74,435	909	0.012212	23.69
46	73,526	944	0.012839	22.97
47	72,582	981	0.013516	22.27
48	71,601	1021	0.014260	21.56
49	70,580	1063	0.015061	20.87
50	69,517	1108	0.015939	20.18
51	68,409	1156	0.016898	19.50
52	67,253	1207	0.017947	18.82
53	66,046	1261	0.019093	18.16
54	64,785	1316	0.020313	17.50
55	63,469	1375	0.021664	16.86
56	62,094	1436	0.023126	16.22
57	60,658	1497	0.024679	15.59
58	59,161	1561	0.026386	14.97
59	57,600	1627	0.028246	14.37
60	55,973	1698	0.030336	13.77
61	54,275	1770	0.032612	13.18
62	52,505	1844	0.035120	12.61
63	50,661	1917	0.037840	12.05
64	48,744	1990	0.040826	11.51
65	46,754	2061	0.044082	10.97
66	44,693	2128	0.047614	10.46
67	42,565	2191	0.051474	9.96
68	40,374	2246	0.055630	9.47
69	38,128	2291	0.060087	9.00
70	35,837	2327	0.064933	8.54
71	33,510	2351	0.070158	8.10
72	31,159	2362	0.075805	7.67
73	28,797	2358	0.081883	7.26
74	26,439	2339	0.088468	6.86
75	24,100	2303	0.095560	6.48
76	21,797	2249	0.103179	6.11
77	19,548	2179	0.111469	5.76
78	17,369	2092	0.120444	5.42
79	15,277	1987	0.130065	5.09
80	13,290	1866	0.140406	4.78
81	11,424	1730	0.151436	4.48
82	9,694	1582	0.163194	4.18
83	8,112	1427	0.175912	3.90
84	6,685	1268	0.189678	3.63
85	5,417	1111	0.205095	3.36
86	4,306	958	0.222480	3.10
87	3,348	811	0.242234	2.84
88	2,537	673	0.265274	2.59
89	1,864	545	0.292382	2.35
90	1,319	427	0.323730	2.11
91	892	322	0.360987	1.89
92	570	231	0.405263	1.67
93	339	155	0.457227	1.47
94	184	95	0.516304	1.28
95	89	52	0.584270	1.12
96	37	24	0.648649	0.99
97	13	9	0.692308	0.89
98	4	3	0.750000	0.75
99	1	1	1.000000	0.50

hemp, catgut, ox aorta, fine wire, horse-hair, and other materials have been used for ligature. Silk, silkworm-gut, and catgut are the materials most used. Dentists' floss has been recommended when large vessels are to be tied, since it does not easily slip. For sutures, silk or silkworm-gut is best. Silver and other wire sutures are not much employed. For cut ends of arteries catgut, properly prepared, is likely the best ligature material. Chromicized catgut is harder than ordinary catgut, and requires soaking in carbolic lotion for an hour before use. It then ceases to be slippery or brittle, and its knot will not yield. Animal ligatures disappear in course of time, while silk ligatures remain and may set up irritation. A single thread should always be used for ligation of arteries.

Preparation of Catgut.—Dry sterilization of catgut seemed to become the general procedure a few years ago, but extensive trial has shown that it cannot be relied upon in rendering the material absolutely safe for practical use. The many failures of catgut as an aseptic suture and ligature, as heretofore prepared, are responsible for the substitution of silk for catgut in the practice of many surgeons. Instances of even tetanus infection have been traced to the use of catgut. Silk can be readily sterilized by boiling, the simplest and quickest method of effecting absolute sterilization.

The ideal sterilization of catgut consists in rendering the material not only absolutely sterile, but also mildly antiseptic, without impairing its tensile strength. Every surgeon has been anxiously looking for a method by which catgut could be prepared so that it could be sterilized by boiling without impairing its strength. Experiments have shown that catgut and leather immersed for 48 hours in a 2 to 4 percent solution of formalin undergo an unknown chemic change, which alters their texture in such a way that its tensile strength is not impaired, but rather increased, by boiling. The commercial catgut is subjected to the action of the formalin without any previous preparatory treatment of the raw material. Hofmeister, who has done such excellent service in perfecting the formalin preparation of catgut, gives the following most recent method: (1) The catgut is wound on a glass plate with slightly projecting edges, so that the gut is free from the sides of the plate and exposed to the circulation of the boiling and flowing water. The ends of the gut are fastened through holes in the plate. (2) Immersion 12 to 48 hours in aqueous solution of formalin 2 to 4 percent. (3) Immersion in flowing water at least 12 hours to free the gut from the formalin. (4) Boiling in water from 10 to 30 minutes. Ten to 12 minutes are amply sufficient, as all microbes and spores are killed by exposure to boiling heat for that length of time. (5) Hardening and preservation in absolute alcohol containing 5 percent of glycerin and 0.1 percent of corrosive sublimate.

One of the essential conditions of success in this method of catgut sterilization is to wind the gut quite tightly around the glass plate or hollow glass cylinder during the process of sterilization.

The result of Senn's experience has led him to modify the procedure in several ways. Instead of glass plates, ordinary glass abdominal drainage-tubes have been employed, upon which the gut is wound quite tightly. These glass drains have been found an excellent substitute for the plates. An ordinary large test-tube would answer the same purpose. The remaining directions given by Hofmeister were followed to the letter. Numerous inoculations with fragments of catgut prepared by this method in sterile gelatin invariably gave negative results. The catgut is as strong as the raw material, hard, and the knot is less liable to slip than when the ordinary material is used.

In the preparation of catgut Senn has modified Hofmeister's method by substituting iodoform for the corrosive sublimate. After boiling the deformalinized catgut for 12 to 15 minutes, it is cut into pieces of desirable length, tied into small bundles containing from 6 to 12 threads, when it is immersed and kept ready for use in the following mixture: Absolute alcohol 950, glycerin 50, iodoform (finely pulverized) 100. The alcohol dissolves part of the iodoform. The bottle containing the catgut should be closed with a well-fitting glass cork and should be shaken well every few days to bring the dissolved iodoform in contact with the threads. The catgut can be kept in this mixture for any length of time without losing its strength. One of the valuable properties of iodoform applied to a recent wound is to diminish the amount of primary wound secretion. It does not destroy pus microbes, but inhibits their growth.

Silk may be prepared by boiling, after having been wound on glass spools, and kept in an ordinary test-tube, the mouth of which has been stoppered by sterile absorbent cotton. Before use it should be resterilized. It may be put in a carbolic solution, 1:20, to which two-thirds of its quantity of alcohol has been added. This is better than corrosive sublimate solution, since the needles may be threaded and placed in the liquid together with the ligature.

Kangaroo tendon has the advantage over catgut in being uncontaminated by germs when obtained from a healthy freshly-killed animal. It is very carefully prepared and dried and may be kept indefinitely in carbolic acid (1 to 20). The strands are especially valuable for large blood-vessels and varicoceles and deep-buried sutures of the abdominal wall, hernia and muscular union. They are absorbed in about 6 weeks.

Horsehair washed with ether and sterilized by heat is excellent for skin sutures when there is not much tension.

Silkworm-gut is commonly used by anglers. It may be purchased in bundles, and from them suitable pieces should be picked for surgical use. As a rule, pharmacists keep selected material for surgical use. It may be sterilized by heat or it may be soaked in a carbolic solution for 15 minutes before use. The first knot should be a double one, and the second knot tied very lightly or not at all, to obviate breakage. It is an excellent interrupted skin suture, but not adapted for vessels and deep tissues by reason of its remaining rigid and unabsorbed.

Silver wire is used for skin sutures when there is much tension, and combined with lead for bone suture. Its polished surface has the advantage of not attracting germs.

The method of tying a ligature is as follows: Usually a reef knot is used. See Knot. The fingertips should be pressed down on the ligature surrounding the vessel, to obviate the danger of lifting up the artery from its bed. The ends should be cut short. Absolute cessation of pulsation of the artery below the ligature denotes sufficient ligation, but if the vessel is diseased, the knot should be made most deliberately. The preparation of ligatures is also discussed in the article on Abdominal Section (*q. v.*). See also Arteries (Ligation).

LIGHTNING, INJURIES.—In nonfatal injuries sudden collapse, with unconsciousness, is followed by drowsiness, fever, much prostration, and occasionally by delirium and convulsions. Paralysis of one or more limbs, severe neuralgic pains, impairment of vision, and even blindness are results. A long list of sequels, due to progressive inflammatory changes and shock, has been recorded. Superficial injuries show spots of ecchymosis, burns greatly varying in extent and severity, and dusky patches due to fused buttons, chains, studs, etc. Arrest of the growth of the hair is another result of injury from lightning. The mortality of injuries from lightning is about 25 percent. When a person is killed suddenly, the body either falls at once to the ground or becomes rigid and remains fixed in a more or less erect attitude. Such a person may not present a visible mark of injury or the body may be mutilated and the bones of limbs or cranium widely comminuted and exposed. The clothes may be untouched or be reduced to shreds and torn away. Rigor mortis comes on rapidly in fatal cases. Instances of rupture of the heart and of the stomach have been recorded.

The treatment of the resultant shock consists in the application of warmth to the surface of the body; the administration of stimulants by mouth, rectum, or hypodermically, and, when necessary, the use of artificial respiration. Local lesions require their proper treatment, for which see Burns, Electricity (Injuries). Burns caused by lightning heal very slowly. Paralyses ensuing often yield to the influence of galvanism when properly and regularly given.

LIGHT THERAPY.—See Phototherapy.

LIME.—The popular name for calcium oxid, CaO (quicklime), and calcium hydroxid, $Ca(HO)_2$. Calcium oxid (quicklime) has a great affinity for water and for CO_2. On contact with the former, slaked lime is formed, with the evolution of heat. On living tissues it acts as a caustic. **L., Burnt, L., Caustic,** calcium oxid, quicklime. **L., Chlorid of, L., Chlorinated,** the chlorid of lime of commerce, is not a distinct chemic compound; its chief constituent, and the one on which its disinfectant properties depend, is calcium hypochlorite, which liberates chlorin. **L., Milk of,** a milky fluid consisting of calcium hydroxid suspended in water. **L., Quick-, L., Slaked,** common terms for lime. **L. Ointment,** an ointment consisting of slaked lime, 4; lard, 1; and olive oil, 3. **L.-water,** a solution of calcium hydroxid in water. It is astringent and alkaline and prevents the formation of dense coagula if added to milk. Dose, 4 to 8 drams. **L., Syrup of** (*syrup of calcium hydroxid*)—contains 6 1/2 percent of lime, and 40 of sugar, the latter aiding the solvent power. Dose, 10 to 60 minims. It is an antidote to poisoning by oxalic acid and phenol. **L., Liniment** (*Carron oil*)—contains equal volumes of lime-water and linseed oil, mixed by agitation. For local use.

Lime-water is a useful antacid. In diabetes, in uric acid diathesis, and in excessive nausea and vomiting, teaspoonful doses of milk and lime-water will be retained when nothing else will remain on the stomach. Lime-water is given in the dose of 1 dram to 2 ounces. Externally, lime-water is used in tinea capitis, and in burns when mixed with equal parts of linseed oil or olive oil, forming *carron oil.* In membranous croup and in diphtheria lime-water is useful as a spray or on a swab. Lime-water is made by pouring 2 quarts of boiled and filtered water upon a piece of unslaked lime about the size of a walnut. After stirring and allowing to settle in an earthen jar, the clear liquid is poured off for use. See Calcium.

LINIMENTS (Linimenta).—Very thin ointments for external application, intended to be applied with friction to the skin. They are solutions of various substances in oily liquids or in alcoholic liquids containing fatty oils. There are 8 official liniments.

Official Liniments.—

Title.	Base.	Constituents.
Linimentum:		
Ammoniæ (ammonia), (*Volatile Liniment*),	Cottonseed oil.	Ammonia water, 350 c.c.; alcohol, 50 c.c.; cottonseed oil, 570 c. c.; oleic acid, 30 c.c.
Belladonnæ (belladonna),	Alcohol.......	Camphor, 50 gm.; fldext. belladonna, to make 1000 c.c.
Calcis (carron oil),	Linseed oil....	Lime water, linseed oil, equal parts.
Camphoræ (camphor),	Cottonseed oil.	Camphor, 200 gm.; cottonseed oil, 800 gm.
Chloroformi (chloroform),	Alcohol.......	Chloroform, 300 c.c. soap liniment, 700 c.c.
Saponis (soap),..	Alcohol.......	Soap (gran.), 60 gm.; camphor, 45 gm.; oil rosemary, 10 c.c.; alcohol, 725 c c.; water to make 1000 c.c.
Saponis mollis (soft soap).	Alcohol.......	Soft soap, 650 gm.; oil lavender flowers, 20c. c.; alcohol, to make 1000 c.c.
Terebinthinæ (turpentine).	Oil of turpentine.	Rosin cerate, 650 gm.; oil turpentine, 350 gm.

LINSEED (Flaxseed).—The seed of *Linum usitatissimum* (flax), a cultivated annual plant. It contains 15 percent of mucilage in the epithelium, also 30 to 40 percent of fixed oil in the embryo. Ground linseed should yield not less than 25 percent of the fixed oil.

Therapeutics.—Linseed is demulcent, emollient, expectorant, and diuretic. The oil is laxative in a dose of 1 ounce, and in smaller doses is oxidised in the system. The infusion contains the mucilaginous principle and a small portion of the oil, and is advantageously used in inflammations of the mucous membrane of the throat, the gastrointestinal tract, and the urinary passages. It is an excellent demulcent in coughs of various kinds, and will be found very serviceable in cystitis, irritable bladder, renal colic, strangury, etc. The oil may be administered internally as a laxative, and has considerable reputation as a remedy for hemorrhoids in doses of 2 ounces twice daily. For laxative purposes (especially in children) it is usually administered as an enema. Externally it is a favorite application to burns, when made into an emulsion with lime-water. The ground seed (linseed or flaxseed meal) is one of the best agents for making poultices, and is universally employed for that purpose, though it is objectionable from an aseptic point of veiw.

To make a **linseed poultice,** the following materials must be collected: (1) A sheet of tow, a folded flannel or cloth—in an emergency a sheet of brown paper or large cabbage-leaf—spread out on a table or board, and a little larger than the part to be poulticed; (2) a bowl and spoon; (3) the crushed linseed; (4) a kettle and boiling water. Warm the basin and spoon by pouring into the former some boiling water, and empty it out. Put in some meal and add a very little hot water. Stir into a paste with the heated spoon. Continue doing this until enough paste to cover the tow has been made. It should now be spread 1/4 inch thick evenly and flatly to within 1 inch of the edges of the tow or cloth, which edges are folded up to form a margin. Too much or too little water is harmful, making the poultice soft and sloppy or sticky. The poultice should be made at the bedside, and the linseed placed next to the skin, and removed after 2 hours. See FLAXSEED; POULTICE.

Preparations.—**L., Ol.,** the fixed oil of linseed expressed cold; a glycerid of linoleic acid. Dose, 1/2 to 2 ounces. **Carron Oil,** linseed oil emulsified in lime-water; used for burns.

LINT.—A loosely woven or partly felted mass of broken linen-fibers, made by scraping and "picking" old linen cloth. It is used as a dressing for wounds and raw surfaces. Common lint is twilled on one side and "woolly" on the other. In the spreading of an ointment the twilled side is used.

LIPEMIA.—See BLOOD.

LIPOMA.—A fatty tumor. See TUMORS.

LIPS, DISEASES. Herpes.—A crop of herpetic vesicles which burst in a few days, leaving a scab, is common upon the lips, especially in gastric and febrile disturbances. The vesicles may be moistened with alcohol, cologne water, camphor water, or smeared with alum, zinc ointment, boric ointment, etc.

Cracks and fissures of the lip following exposure to cold, etc., in dyspeptics, are very common, and if neglected, may form deep and painful fissures, prone to bleed and obstinate to heal. A simple ointment, and, if persistent, touching them with silver nitrate, will generally suffice to cure them. They must not be mistaken for the fissures about the corners of the mouth so common in congenital and acquired syphilis.

Papillomata or **warty growths** of the lips are of interest in that they are liable, as age advances, to become epitheliomatous. They may sometimes grow out in the form of horns. Extirpation with the knife is the proper treatment.

Superficial ulcers on the inner surface of the lip are common accompaniments of errors in digestion and of secondary syphilis. There are usually similar ulcers on the side of the tongue and cheeks. Silver nitrate or chromic acid lotions are the best local applications.

Nevus of the lip, when small, may be touched with nitric acid or sodium ethylate; and when pendulous and projecting from the free margin, ligated. When involving the whole substance of the lip, it may be treated by electrolysis, or, better, excised by means of a V-shaped incision.

Hypertrophy of the lip, generally the upper, is often met with in connection with cracks and fissures in strumous children, and is known as the *strumous lip.* A similar condition is sometimes met in congenital syphilis and in chronic nasal catarrh. The thickening, as a rule, disappears under constitutional treatment and as the patient grows older. The removal of a wedge-shaped piece, as advised by some, is seldom necessary.

Carbuncle of the lip is a most dangerous disease, as it is very likely to lead to infective phlebitis of the facial vein, which may spread thence through the ophthalmic vein to the cavernous and other cranial sinuses, and terminate in infective meningitis or in general blood-poisoning. Free incisions should be made, the sloughs scraped away, antiseptics applied, and the strength supported by fluid nourishment and stimulants.

Adenoma or **labial glandular tumor** (Paget) occasionally occurs in the lip as small, smooth, elastic growths projecting under the mucous membrane. It sometimes contains nodules of cartilage, and is then of harder consistency. It should be removed from the mucous surface to avoid scarring.

Cysts due to obstruction of the mucous follicles are frequent in the lip. They contain a glairy fluid, and appear as small, tense, semitranslucent, globular, bluish-pink swellings on the mucous surface. A free incision through the mucous membrane, and removal of the cyst-wall with forceps, is perhaps the best treatment.

Mucous patches are sometimes observed on the mucous surfaces of the lips, most frequently at the angle of the mouth or in the groove between the gums and lips. They are usually superficial, not elevated, and present the appearance as if a silver nitrate stick had been drawn across the surface; the latter circumstance has given rise to the term "opaline patches." When situated at the angle of the mouth, they may become fissured, painful, and bleeding. Their surrounding area lacks the semblance of acute inflammation, being somewhat dull and congested; this fact proves important in differentiating them from the patches of aphthous stomatitis. The previous history, the adenopathy, the presence, perhaps, of a cutaneous lesion, and the resistance to ordinary local treatment would serve to render the diagnosis clear. See Syphilis.

Epithelioma nearly always occurs in men, and on the lower lip; and although it may affect nonsmokers, it generally appears to be due to the irritation and heat of a short clay pipe. It begins as a crack, small ulcer, or indurated tubercle, and may either spread superficially along the free margin of the lip or extend deeply into its substance. Sooner or later it involves the whole lip and adjoining parts, becomes adherent to the jaw, and invades the bone. The lymphatic glands in the neck become involved, but dissemination through internal organs is rare. If removed early, it may not recur until after a long period of immunity or, perhaps, not at all. It seldom returns in the scar, but in the lymphatic glands, the patient dying of exhaustion induced by ulcerating and bleeding masses in the neck.

Diagnosis.—The affection is likely to be mistaken for hard chancre, and the latter has been cut away under the impression that it was an epithelioma. The following points should serve in diagnosis: (1) Epithelioma generally occurs in the old, and in men, and on the lower lip; chancre in the young, in women, and on the upper lip. (2) The epitheliomatous ulcer has hard, sinuous, and everted edges, and an indurated and warty base; the chancrous is raised, excoriated, smoother, and the induration is more circumscribed. (3) In the malignant affection the glands are not affected until late in the disease—perhaps 6 months; in the syphilitic, early—say 6 weeks. Moreover, in chancre secondary symptoms will be present or soon appear, and the disease readily yields to antisyphilitic remedies. See Epithelioma.

Treatment.—Free and early excision is imperative. The growth may be either included in a V-shaped incision, the wound being afterward united by harelip pins, or, if superficial, freely shaved off. The glands in the neck, if enlarged and not too extensively diseased, should be extirpated at the same time. When the bone is involved, a portion of the jaw may be removed if the whole disease can be exterminated.

Harelip.—See Harelip.

LIQUID AIR (Carbon Dioxid Snow).—See Air, Liquid.

LIQUOR.—In pharmacy any solution in water of nonvolatile substances, except infusions, decoctions, syrups. There are 25 official solutions: **Liquor Acidi Arsenosi.** Should contain arsenous acid, corresponding in amount to 1 percent of arsenic trioxid. Medical properties same as Fowler's solution. Average dose, 3 minims. **Liquor Ammonii Acetatis** (spirit of Mindererus). An aqueous solution which should contain not less than 7 percent of ammonium acetate, together with small amounts of acetic and carbonic acids. Diaphoretic in fevers. Average dose, 4 drams. **Liquor Antisepticus.** (Similar to listerine, etc.) Boric acid, 20 gm.; benzoic acid, 1 gm.; thymol, 1 gm.; eucalyptol, 0.25 c.c.; oil of peppermint, 0.50 c.c.; oil of gaultheria, 0.25 c.c.; oil of thyme, 0.10 c.c.; alcohol, 250 c.c.; purified talc, 20 gm.; water, to make 1000 c.c. Average dose, 1 dram. **Liquor Arseni et Hydrargyri Iodidi** (solution of arsenic and mercuric iodid) (Donovan's solution). Contains 1 percent of each of the active ingredients. Alterative. Average dose, 1 1/2 minims. **Liquor Calcis** (solution of calcium hydrate; lime water). A saturated solution. Antacid, tonic and astringent. Average dose, 4 drams. **Liquor Chlori Compositus.** Compound solution of chlorin. Chlorin water. (To replace Aqua Chlori, U. S. P., 1890.) An aqueous solution containing, when freshly prepared, about 0.4 percent of chlorin with some oxid of chlorin and potassium chlorid. Average dose, 1 dram. **Liquor Cresolis Compositus.** (Similar to lysol.) Cresol, 500 gm.; linseed oil, 350 gm.; potassium hydroxid, 8 gm.; water to 1000 gm. **Liquor Ferri Chloridi.** An aqueous solution of ferric chlorid which should contain not less than 29 percent of the anhydrous salt, corresponding to 10 percent of metallic iron. Average dose, 1 1/2 minims. Used in preparing tincture of ferric chlorid; also externally as a styptic to arrest hemorrhage. **Liquor Ferri et Ammonii Acetatis** (Basham's mixture). Contains in each thousand c.c. Tr. Ferri. Chlor. 40 c.c., Acid Acetic Dil. 60 c.c., Sol. Ammon. Acet. 500 c.c., Aromat. Elix. 120 c.c., glycerin 120 c.c., water to 100 c.c. Actively chalybeate, also astringent, and very largely used in Bright's disease. Average dose, 4 drams. **Liquor Ferri Subsulphatis** (solution of basic ferric sulphate, Monsel's solution). An aqueous solution of variable chemical composition, containing an amount of basic ferric sulphate corresponding to not less than 13.57 percent. of metallic iron. Styptic to bleeding surfaces; used internally in hemorrhage of stomach and bowels. Average dose, 3 minims. **Liquor Ferri Tersulphatis.** An aqueous solution which should contain about 35 percent of normal ferric sulphate, corresponding to not less than 10 percent of metallic iron. Used for preparing other iron preparations, as in the preparation of the antidote for arsenic. **Liquor Formaldehydi** (formalin). An aqueous solution, containing not less than 37 percent by weight of absolute formaldehyd. **Liquor Hydrargyri Nitratis.** A liquid which should contain about 60 percent of mercuric nitrate, and about 11 percent of free HNO_3. Caustic application to chancre, etc. **Liquor Iodi Compositus** (Lugol's solution). Should contain not less than 5 percent iodin, 10 percent potassium iodid. Average dose, 3 minims. **Liquor Magnesii Citratis.** Made by dissolving 33 gm. citric acid in 120 c.c. of water and adding 15 gm. magnesium carbonate; dissolving; filtering into a bottle holding 360 c.c. (containing 120 c.c. syrup of citric acid), adding enough water to nearly fill the bottle, dropping in 2.5 gm. potassium bicarbonate; shaking until dissolved; corking, and securing the cork with twine. Average dose, 12 drams. **Liquor Plumbi Subacetatis.** (Sometimes called Goulard's extract.) An aqueous liquid, containing not less than 25 percent of lead subacetate. Used externally as a sedative in sprains, etc., when dilute, from 1/2 or 1 part to 16 parts distilled water. **Liquor Plumbi Subacetatis Dilutus** (lead water). Contains 4 percent of the stronger lead water. Astringent and sedative externally. **Liquor Potassii Arsenitis** (Fowler's solution). An aqueous solution which should contain potassium arsenite corresponding in amount to 1 percent of arsenic trioxid, formed by the combination of arsenous acid with potassium of the potassium bicarbonate (carbon dioxid being evolved). Compound spirit of lavender is added to give it taste, and prevent its being mistaken for water; 100 minims equal about 1 grain arsenic. Average dose, 3 minims. **Liquor Potassii Citratis** (Mistura Potassii Citratis). An aqueous liquid, containing in solution not less than 8 percent of anhydrous potassium citrate, together with small amounts of citric and carbonic acids. Made by dissolving separately potassium bicarbonate and citric acid, and afterward mixing the solution, under the names *neutral mixture, saline mixture*, or *effervescing draught;* long used as a refrigerant diaphoretic. Average dose, 4 drams. **Liquor Potassii Hydroxidi.** (Liquor Potassæ, U. S. P., 1880.) An aqueous solution containing about 5 percent of potassium hydroxid. Average dose, 15 minims. **Liquor Sodæ Chlorinatæ** (Labarraque's solution). An aqueous solution of several chlorin compounds of sodium, containing at least 2.4 percent by weight of available chlorin. Stimulant, antiseptic, and resolvent. Average dose, 15 minims. Also, use locally for fetor, etc. A powerful disinfectant. **Liquor Sodii Arsenatis.** Should contain sodium arsenate corresponding in amount to not less than 1 percent of exsiccated sodium arsenate. Average dose, 3 minims. **Liquor Sodii Hydroxidi.** (Liquor Sodæ, U. S. P., 1890.) An aqueous solution containing about 5 percent of sodium hydroxid. Average dose, 15 minims. **Liquor Sodii Phosphatis Compositus.** Sodium phosphate, 1000 gm.; sodium nitrate, 40 gm.; citric acid, 130 gm.; distilled water, to 1000 c.c. Average dose, 2 drams. **Liquor Zinci Chloridi.** An aqueous solution containing about 50 percent by weight of zinc chlorid. A substitute for Burnett's disinfecting fluid. Used locally to disinfect fetid discharges; also employed for preserving anatomical specimens.

LIQUOR AMNII.—See Amnii (Liquor).

LIQUORICE.—See Glycyrrhiza.

LITHEMIA.—Modified gout. A condition in which, owing to defective metabolism of the nitrogenous elements, the blood becomes charged with deleterious substances, principally, perhaps, of the uric acid group, although their exact chemic nature is not determined. See Uric Acid, Gout, Rheumatism.

LITHIA.—Li_2O. Oxid of lithium, an alkaline caustic. **L. Water,** mineral water containing lithium salts in solution. Among the best known in the United States are the Buffalo lithia water, water from Buffalo Lithia Springs, Mecklenburg County, Va.; Farmville lithia water, from Farmville, Va.; Londonderry lithia water, from Londonderry, N. H. The proportion of bicarbonate of lithium contained in the 3 waters mentioned is as follows: Londonderry, 8.620; Buffalo, 1.484 to 2.25; Farmville, 1.99.

LITHIUM.—Li = 7; quantivalence, 1. One of the rarer alkaline metals, a few of the salts only being used in medicine. Because of its low atomic weight, its high saturating power makes its salts more highly alkaline than those of sodium and potassium. The carbonate and citrate are used largely in rheumatism and gout. **L. Benzoas.** Dose, 5 to 20 grains. **L. Bromidum.** See Bromin. Dose, 5 to 20 grains. **L. Carbonas,** not deliquescent. Dose, 2 to 15 grains. **L. Citras,** deliquescent. Dose, 5 to 20 grains. **L. Citras Effervescens,** effervescent lithium citrate, prepared from citrate 5, with sodium bicarbonate 57, tartaric acid 30, citric acid 19 1/2. Dose, 1 to 3 drams in water, as an effervescent drink. **L. Salicylas.** See Salicylic Acid. Dose, 5 to 20 grains.

LITHOLAPAXY.—See Bladder (Stone).

LITHONTRIPTICS.—See Antilithics.

LITHOTOMY.—See Bladder (Stone).

LITMUS.—A blue pigment obtained from *Rocella tinctoria*, a lichen. It is employed in chemic determinations to detect the presence of acids and alkalies. **Blue litmus paper** is unsized paper steeped in a solution of litmus; it turns red on contact with acid solutions. **Red litmus paper** is unsized paper steeped in litmus tincture, colored red with acid; it turns blue on contact with alkaline solutions. See Acidity, Alkalinity, Urine (Examination).

LITTER.—The following qualities are essential for a litter or stretcher: 1. Firm and comfortable support for the patient, and capability of being readily cleansed. 2. Lightness. 3. Strength. 4. Simplicity of construction. 5. Capability of being folded up, if possible. 6. Such connection of component parts as to prevent risk of loss. 7. Provision for keeping patient a certain distance above ground when the litter is laid down. 8. Economy.

A two-handed seat or litter may be devised by 2 bearers facing each other, locking the fingers of the left hand of one with the fingers of the right hand of the other. The support is placed beneath the patient's thighs in front of the buttock for a seat, the disengaged hands resting upon and grasping each other's shoulders behind the patient, and thus forming a back support. The arms of the patient may be passed around the neck of each bearer.

A three-handed seat may be made by 2 persons facing each other, the thick part of the forearm just below the elbow of one being grasped by his right hand and with the left hand the left forearm of the other being grasped. This left forearm now grasps the right forearm of the other bearer at about its middle. The right hand of the second bearer grasps the left shoulder of the other bearer to form a back support. The seat formed is a triangular one, and is formed by the 3 forearms.

A four-handed seat is made by 2 bearers grasping their own left forearms with their own right hands at or about their wrists. The left hand of each grasps the right forearm of the other.

Swords in their scabbards may be passed through the sleeves of a coat turned inside out and the coat skirts buttoned from below upward, for 2 or 3 buttons over the sleeves incasing the swords.

Improvised stretchers or litters may be made out of hurdles, shutters, or planks. In the 2 latter cases straps, ropes, or wooden traverses must be passed beneath, between 2 bearers at the head and 2 at the feet.

A rifle litter may be made with a blanket or rug, 2 rifles being laid on the ground at each side and the blanket folded over them.

LIVE BIRTH, TESTS.—See Viability.

LIVER, ABSCESS (Suppurative Hepatitis).—

Etiology.—Abscess of the liver is probably always of microbic origin. The infection may reach the liver by way of the hepatic artery, from ulcerative endocarditis, general septicemia, etc.; or the hepatic vein; or the common duct. Secondary to a suppurative cholangitis set up by biliary calculi or parasites, but generally it enters *viâ* the portal vein in the form of an infectious thrombus or embolus or the ameba coli. Thus septic emboli from suppurative appendicitis, gastric ulcer or dysentery may enter the liver. In most instances, however, abscess of the liver is due to the ameba coli and is preceded by amebic dysentery, though in some amebic abscesses there are no intestinal symptoms. Occasionally it results from infective traumatism. It may be secondary to an infected hydatid cyst. See Colon Bacillus Infection.

Pathology.—In two-thirds of the cases of abscess of the liver the middle portion of the right lobe is affected. The abscess varies in size and may be either single or multiple. Amebic abscess is usually single and large, while pyemic metastatic abscesses are small and multiple. Frequently both lobes are involved and the liver may be greatly increased in size. The pus may be reddish in color or creamy, and frequently it is sterile. The abscess may rupture into the bowel, abdominal cavity, or bronchi.

Symptoms and Clinical Course.—There are probably many cases of abscess of liver which are never diagnosed, owing to the latency of many of the symptoms in the early stages. The first subjective symptoms probably are: Pain in the right hypochondriac region, or region of the right scapula, of a deep-seated character; gradual decline of health with loss of flesh; intermittent, irregular high fever 105° F.; rapid and feeble pulse and frequent chills, followed by profuse perspiration. Hectic symptoms may be present. These are the classic symptoms of infection, yet they do not lead us to the correct diagnosis, and frequently the physical signs are distinctly misleading.

Physical Signs.—**Inspection** frequently detects bulging in the right hypochondrium, and slight jaundice.

Palpation detects enlargement and a deep-seated pain. Frequently there is an edematous condition over the affected part, and fluctuation may be present if the abscess is superficial. If the lower portion of the right lobe is affected, the enlargement extends downward. In the early stages the area is hard, but later, as the disease advances, it softens and may give rise to fluctuation.

Percussion detects an increased area of dulness in the direction of the portion involved. Osler states that the enlargement is most frequently upward, and that at the nipple-line the curve of liver dulness begins to rise and in the midaxillary

Abscess of Liver.	Hepatic Intermittent Fever.	Cancer.	Malarial Fever.	Hydatid Cyst.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*
1. History of traumatism, dysentery.	1. History of hepatic colic and transient jaundice.	1. Often inherited tendency.	1. History of malarial exposure.	1. History negative
2. Pain in region of right hypochondriac region or right scapula.	2. Same as abscess....	2. Same as abscess....	2. Pain slight or absent.	2. Pain absent.
3. Intermittent, irregular, high fever, with sweat and chills not controlled by quinin.	3. Same as abscess....	3. Same as abscess....	3. Temperature controlled by quinin.	3. Temperature normal.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*
1. Jaundice slight.......	1. Jaundice intense....	1. Jaundice...........	1. No jaundice........	1. Jaundice usually absent.
2. Bulging in right hypochondrium.	2. Negative..........	2. Negative..........	2. Negative..........	2. Bulging in epigastric or hypogastric region.
3. Liver enlarged and smooth; occasionally edema and fluctuation in right hypochondrium.	3. Liver slightly decreased in size.	3. Liver enlarged and nodular.	3. Liver may be slightly enlarged and smooth. Spleen enlarged.	3. Liver dulness increased in area.
4. Percussion confirms palpation.	4. Same..............	4. Increased area of dulness.	4. Percussion confirms palpation.	4. Percussion often detects a vibratory sensation.
5. Aspiration detects pus.	5. Negative..........	5. Negative..........	5. Negative; plasmodium in blood confirms diagnosis.	5. Aspiration detects clear fluid containing glucose.

line it may reach the fifth rib, while behind, near the spine, the area of dulness may be so high as to be on a level with the angle of the scapula.

Diagnosis depends upon the subjective and objective symptoms.

Prognosis is unfavorable.

Treatment.—If the pain is severe, opium, 1 grain, is advisable every 4 hours. Locally, a hot-water bag, mustard plaster, or hot turpentine stupes may afford some relief. The bowels should be kept open by means of salines.

Stimulants, such as whisky, 4 drams, are allowable every 4 hours, if necessary. Quinin, 4 grains, with dilute nitrohydrochloric acid, 6 minims, may be of benefit.

Medicines, as a rule, are only palliative, and surgical measures give a better chance for recovery.

Surgical Treatment.—(1) If the skin over the swelling is red and pits on pressure, there can be little doubt either as to the existence of an abscess or to the presence of adhesions. In such circumstances an aspirating needle may be used as a preliminary, to act as a guide, but as soon as it has entered the cavity and the diagnosis is confirmed, the opening should be enlarged, so that the pus can escape as freely as possible, and a full-sized drainage-tube inserted. The following day, when the adhesions are firmer, the abscess cavity may be explored with the finger to make sure there are no other sacs in the immediate neighborhood, and, if necessary, washed out with iodin or some other antiseptic. (2) When there is no certainty as to the presence of adhesions the choice lies between aspiration, drainage with a trocar and cannula, and incision (Tyson).

Aspiration is chiefly of use for exploration; it rarely happens that an abscess cavity is completely emptied, and nearly always the swelling appears again within a few days. In a few instances, however, a cure has followed after 2 or 3 repetitions. Puncture with a trocar and cannula is also open to grave objections. If adhesions are present already, it is more satisfactory to make a free incision and allow of thorough exploration and drainage; if they are not, the peritoneal cavity is opened without any safeguard to prevent the pus entering it. Further, the constant movement of the liver in the abdominal cavity frequently renders the retention of a tight-fitting cannula or of a stiff drainage-tube a matter of very considerable difficulty.

Incision directly into the abscess sac can only be practised when the skin over it is reddened and it is certain that the walls are adherent. If this is not definite, either the operation must be carried out in separate stages, or an incision made into the abdomen over the swelling, the surface of the liver exposed, and the abscess opened with the usual precautions to prevent its contents entering the peritoneal cavity. The preliminary steps are the same in both, but while in one the incision is only carried down to the parietal peritoneum, and is then plugged, so that adhesions may form beneath, in the other the abdominal cavity is opened at once and the surface of the liver examined. In a few cases omentum has been interposed, or it has been found that the abscesses are multiple and that there is no hope of thorough evacuation; but if no difficulty of this kind is apparent, the wound is carefully packed around with sponges, and an aspirating needle thrust into the swelling. As soon as the pus is found, the opening is enlarged freely with the knife, and the contents of the abscess allowed to escape completely; the assistant, meanwhile, carefully supporting the liver on either side, so that it shall not fall away from the surface of the abdomen. When the sac is emptied, the cavity may be explored with the finger and the walls stitched to the skin margins of the wound all around. An aspirating needle may be thrust through the two layers of the pleura and diaphragm for the sake of exploring the posterior surface of the liver without risk; but if a permanent drain is required, a free incision should be made down to the parietal pleura, a portion of one of the ribs being resected if necessary, the two layers of the pleura accurately sutured together with catgut (there is no difficulty in this in the lower intercostal spaces), and then the trocar and cannula thrust through, so as to avoid the risk of air or pus entering into the pleural space.

LIVER, ACUTE YELLOW ATROPHY.—A fatal form of disease of the liver, characterized anatomically by a rapid destruction of the liver cells, diminution in size of the organ, and associated with deep jaundice and grave nervous symptoms.

Synonyms.—Malignant jaundice, acute parenchymatous hepatitis, icterus gravis.

Etiology.—(1) Female sex; (2) pregnancy; (3) infectious fevers; (4) alcoholism; (5) mental excitement. An acute toxemia may be the main exciting cause.

Pathology.—The liver is greatly reduced in size, often not more than one-third the usual volume during health. This rapid destruction may take place within the course of a few days, or from 1 to 2 weeks. The organ is soft; yellowish in color in the early stages, but later may be reddish (red atrophy). The capsule may be wrinkled. Microscopically, fatty degeneration of the liver cells occurs, taking place first in the periphery and later extending toward the center of the lobule. There is also fatty degeneration of the epithelial cells of the biliary-ducts. The destroyed liver cells and epithelial cells subsequently undergo liquefaction necrosis and are rapidly absorbed, causing shrinkage of the organ. If the disease persists, there is a hyperplasia of the connective tissue, and the color becomes mottled.

Symptoms and Clinical Course.—The initial symptoms occupy a period of 2 or 3 days, and are marked by headache, loss of appetite, nausea and vomiting, gastric distress, jaundice, and, later, delirium or convulsions. Hemorrhages from the mucous membranes may occur, and hematemesis is common. The liver is rapidly reduced in size, while the spleen is considerably enlarged. The urine is deeply bile-stained, of high specific gravity (1030), slightly albuminous, containing fatty casts, leucin, and tyrosin.

Diagnosis.—See LIVER (Cirrhosis).

Prognosis.—The disease is always fatal.

Treatment is supportive and palliative.

LIVER, AMYLOID.—An enlargement of the liver due to infiltration of the tissues by an amyloid substance.

Synonyms.—Lardaceous liver; waxy liver; albuminoid liver.

Etiology.—(1) Prolonged suppuration as in tubercular bone-disease; (2) syphilis; (3) leukemia; (4) rickets.

Pathology.—The liver is enlarged and smooth; the cut surface is semitranslucent (waxy), and resembles in appearance boiled bacon. The amyloid deposit is found mainly in the central portion of the lobules. The initial process seems to be in the capillary blood-vessels, which are often coated with a hyaline material.

The amyloid substance is not deposited to so great an extent in the liver cells, but they may undergo fatty degeneration from want of a free blood supply.

Symptoms and Clinical Course.—The liver is smooth in contour and greatly enlarged, and may reach the umbilicus. There is no pain or jaundice. Ascites is absent except in the last stages. The spleen shares in the process and is greatly enlarged. Often the kidney becomes affected by the albuminoid infiltration, giving rise to albumin in the urine.

Diagnosis rests upon the history of the case; great enlargement of the liver and spleen; absence of jaundice, ascites, hectic symptoms, and the presence of albumin in the urine. From leukemia it must be differentiated by a blood examination.

Prognosis is unfavorable.

Treatment must be directed to the underlying cause.

LIVER, CARCINOMA. Etiology.—(1) Male sex after the fortieth year; (2) usually secondary from neighboring organs.

Pathology.—The organ is enlarged in size, the liver tissue being brownish or yellowish in color. Instead of the surface being smooth, it is generally irregular or nodular.

Varieties.—(1) Nodular form; (2) radiating form; (3) massive form.

In the **nodular form** there are small whitish areas or elevations which project from the external surface.

The **radiating form** produces multiple nodules that are pigmented. It is usually secondary.

In the **massive form** the disease is diffused throughout the whole organ, causing great enlargement. The color is usually grayish-white. The nodules may be hard or soft, the larger ones often showing a degree of fatty degeneration, and may give rise to extravasation of blood into the parenchyma.

Both the large and small nodules project slightly above the serous surface, and in the former variety a degree of umbilication may be seen.

Symptoms and Clinical Course.—There are severe pain over the region of the liver, persistent vomiting, cachexia with rapid loss of flesh and strength, and great anemia (red cells moderately reduced, 4,000,000; hemoglobin may be only 50 percent; moderate leukocytosis). Jaundice is nearly always present. Ascites is usually absent. There is moderate fever—101° to 103° F.

Physical Signs.—**Palpation** detects tenderness, and frequently nodular growths on the free border of the liver.

Percussion confirms palpation, and shows an increased area of dulness in all directions. It also shows the presence of cancer in neighboring organs (stomach, pancreas, etc.).

Diagnosis.—See LIVER (Abscess).

Prognosis.—The duration is from 3 to 15 months.

Treatment is symptomatic and palliative.

LIVER, CIRRHOSIS. Synonyms.—Chronic interstitial hepatitis, hob-nail liver, gin liver, granular liver.

A disease characterized by hyperplasia of the connective tissue, with a destruction to a greater or less extent of the parenchymatous cells, the liver being firmer in consistency.

Etiology.—(1) Male sex; (2) middle life; (3) alcoholism; (4) chronic malarial poisoning; (5) congenital syphilis; (6) passive hyperemia resulting from heart or lung disease; (7) gall stones; (8) rich diet; (9) cause unknown. The causes may act through the portal vein, the hepatic arteries, hepatic vein, or the biliary ducts. It seems probable, as Weigert has shown, that the cells irritated undergo degeneration and die, their place being taken by connective tissue overgrowth, the subsequent contraction of which causes still more destruction of the secreting cells.

Varieties.—(1) Atrophic; (2) hypertrophic.

Atrophic Cirrhosis. Synonyms.—Portal cirrhosis; Læennec's cirrhosis.

Pathology.—The liver is much smaller and harder than normal and its surface is usually roughened with small granulations or nodules, though sometimes it is smooth, owing to a uniform distribution of the connective tissue. The elevations, when present, are due to the contraction of bands of connective tissue which have taken the place of parenchyma, and which surround normal areas of secreting cells. The entire surface is yellowish or mottled if the cells are fatty. Associated with the cirrhosis is frequently found fatty infiltration. The increase in size of the liver due to the latter condition may predominate over the reduction resulting from the cirrhosis. As the disease advances retrograde changes involve also the branches of the portal vein, and even the biliary ducts, causing obstruction in the portal circulation and ascites.

Hypertrophic Cirrhosis. Synonym.—Hanot's cirrhosis.

Pathology.—In this form the hyperplastic connective tissue has not the tendency to contract that it exhibits in the atrophic. Therefore, the liver is enlarged but smooth. Its color is generally yellowish-green. It is believed that the connective tissue overgrowth takes place especially within the lobules. The branches of the portal vein are not encroached upon, but there is obstruction of the biliary channels resulting in jaundice.

Biliary Cirrhosis.—A distinct form according to French clinicians, is believed by some observers to be identical with the hypertrophic variety. It is secondary to obstruction in the gall ducts. The retention of bile in the ducts leading to destruction of the parenchymatous cells, their place is taken by a proliferation of the interstitial connective tissue. There is a deposit of pigment. The organ becomes larger and harder.

Symptoms of Atrophic Cirrhosis.—In the early stages of cirrhosis of the liver symptoms may be absent. The onset is gradual, the initial symptoms being due to obstructed portal circulation which produces chronic gastrointestinal catarrh, with its run of symptoms—coated tongue, anorexia, nausea, flatulence, constipation. Deficiency in the amount of bile secreted is evidenced by the pale stools. As the compression of vessels increases there is a compensatory dilatation of the collateral vessels, as manifested by hemorrhoids, the over-distended superficial abdominal veins, which may be especially pronounced around the umbilicus, forming the **caput medusæ.** Similarly, there result gastric, intestinal, or esophageal hemorrhages; enlargement of spleen, ascites, and even edema of the lungs. Slight jaundice from obstruction of the bile ducts is present in about one-fourth of the cases, but its absence may be due to the paucity of the biliary secretions. There is progressive loss of flesh and strength. Uterine or nasal hemorrhages, or even hematuria may appear. Nervous signs, such as stupor, delirium, coma, sometimes supervene late in the disease.

Physical examination reveals a smaller area of hepatic dulness with increased splenic dulness. The urine is usually scanty, highly colored, of high specific gravity, with abundance of urates, reduction in amount of urea and only infrequently contains biliary pigment.

Symptoms of Hypertrophic Cirrhosis.—Jaundice is generally present, because of some obstruction in the biliary vessels. The liver is not only enlarged and smooth, but tender. There is usually little or no enlargement of the spleen, nor gastrointestinal congestion, nor ascites, nor hemorrhoids. The stools are sometimes pale, at others normal in color. The urine, although scanty and highly colored, frequently contains biliary pigment, while the quantity of urine is normal. There is a marked reduction in the number of red blood cells and increase in the number of leukocytes.

Complications.—Concomitant increase in the connective tissue of heart, lungs, blood-vessels, autointoxication from suppression of biliary secretion.

Diagnosis.—(1) **Of Atrophic Cirrhosis.**

In the early stages diagnosis is uncertain; but it is clear when reduction in size of the organ is found, associated with ascites. The emaciation and effusion of tuberculous peritonitis may be confusing, but, in the latter disease, the effusion is not so abundant and is of higher specific gravity, and there is abdominal tenderness and fever, and no reduction in the size of the liver. If doubt exists, the tuberculin test should be resorted to.

(2) **Of Hypertrophic Cirrhosis.**

Hypertrophic cirrhosis must be differentiated from chronic biliary obstruction, cancer of liver, amyloid liver, multilocular echinococcus cyst. In the secondary cirrhosis of chronic biliary obstruction the liver is not so enlarged, the course is more rapid and is attended with attacks of hepatic colic. In carcinoma the patient is older, with no alcoholic habit, or enlargement of the spleen, the liver is not so smooth, ascites is more general. In amyloid liver there is the characteristic etiology and no pain or jaundice. In hydatid disease the nodules on the surface become soft.

Prognosis.—The duration of hypertrophic cirrhosis is from 1 to 2 years. Atrophic cirrhosis has a longer coma. Fatal terminal symptoms, such as rapid pulse, fever, delirium, may appear rather suddenly. The disease, however, is not always fatal; if the process be not too far advanced and the cause, such as alcohol, removed, the patient may indeed recover tolerably good health. Usually, however, death ensues from exhaustion and toxemia.

Treatment.—The chief objects to be attained are the removal of the cause, the relief of the symptoms and restitution of the normal conditions in the liver. Alcohol must be interdicted. The gastrointestinal catarrh should receive careful attention. The diet should be nutritious, yet simple so as not to tax the more or less impaired digestion. Fats should be restricted and too much starchy food should not be allowed for fear of setting up additional fermentation. The free drinking of alkaline mineral waters, especially when hot, or of simple hot waters, before meals, particularly before breakfast, is valuable to remove the excessive mucus. The extensive fermentation may be alleviated by internal antiseptics, such as sodium phenolsulphonate or phenyl salicylate.

Depletion by salines or minerals is indicated. For instance 5 to 10 grains of blue mass at night followed in the morning by sodium phosphate or Hunyadi water one-half hour before breakfast, will relieve the congestion. Calomel in doses of 1/10 grain, frequently repeated, is excellent. Laxative mineral waters, such as Saratoga water, have a similar effect. Occasionally it is well to alternate with the salines cascara sagrada, or compound jalap powder. A diminution of the ascites effected by this treatment is further aided by diuretics. The potassium salt to be preferred is the acetate in doses of 20 grains t. i. d. citrated caffein may be given in doses of 2 to 5 grains. Theobromin has proved valuable in the hands of some observers.

Abdominal paracentesis, or tapping, must be employed when the effusion is sufficiently large to cause discomfort or additional symptoms of pressure. Frequently repeated treatment may be necessary, as the fluid may speedily reaccumulate.

Surgical Treatment of the Ascites.—Talma's operation—omentopexy—suture of the parietal peritoneum of the abdomen and omentum to the liver, to relieve the liver conditions by the establishment of a collateral circulation between the portal and systemic vessels has been found effective if not resorted to too late.

Attempts to check the progress of the degenerative changes and to effect repairs have been for the most part futile. Iodin in some form should be tried, especially if a specific origin is suspected. Potassium iodid is given for a long time in doses of 3 to 10 grains, well diluted, and on an empty stomach. Some observers prefer the syrup of hydriodic acid, 1 dram, well diluted, one-half hour before food. Other drugs, such as ammonium chlorid and nitrohydrochloric acid, have been used. Organotherapy is advocated by certain French clinicians.

LIVER, CONGESTION. Varieties.—(1) Active; (2) passive.

Etiology. Active Hyperemia.—(1) Overindulgence in food or drink; (2) warm climate; (3) infectious fevers. "Biliousness" is probably a form of active hyperemia.

Passive hyperemia usually results from valvular disease of the heart, disease of the lungs or pleura, or pressure on the vena cava.

Pathology.—The liver is enlarged in size from congestion of the blood-vessels. The organ is bluish-red or brownish-red in color. In certain areas the intralobular vein is filled with dark blood, while the adjacent capillaries are empty and opaque, giving rise to a mottled appearance—"nutmeg liver."

If of long standing, an overgrowth of the connective tissue occurs with a considerable amount of pigmentation and atrophy of the hepatic cells, giving rise to a condition called "cyanotic induration."

Symptoms and Clinical Course. Active Hyperemia.—There is anorexia, dull headache, mental hebetude, coated tongue, bitter, disagreeable taste in the mouth, feeling of nausea, often vomiting of material containing the biliary salts, fever, constipation or diarrhea in which the feces have a distinctly greenish color and cause great tenesmus. The urine is high-colored and scanty. Hemorrhoids are frequently produced.

Passive Hyperemia.—There is great enlargement of the organ, due to stagnation of the blood; and if the right heart is affected, there is often distinct pulsation in the liver.

Prognosis.—In active hyperemia the prognosis is good. In passive congestion, as there is disease in other organs, the prognosis is less favorable.

Treatment of Active Hyperemia.—Rest in bed and a liquid diet are demanded. Of many remedies recommended, calomel holds the first place. It is best given in small doses, 1/4 of a grain, every hour until 6 or 7 doses have been taken, and followed by a saline purge if the bowels do not move within 10 or 12 hours. If there is much pain in the right hypochondriac region, a series of small blisters, 1 by 2 inches, may be produced by means of cantharidal plaster, or the red iodid of mercury, 40 grains, with petrolatum, 1 ounce. In the more chronic forms the fats and foods containing sugar must be restricted. Frequent bathing and plenty of out-door exercise are invaluable.

Constipation may often be relieved by proper regimen, and the use of the fluidextract of cascara, 1/2 of a dram, at bedtime. Nitrohydrochloric acid, 6 minims, combined with pepsin, 5 grains, may afford relief.

The elixir of the phosphates of iron, quinin, and strychnin, 1 dram, is frequently beneficial.

Treatment of passive hyperemia must be directed mainly to the underlying cause. Depletion may be produced by rest in bed, a light diet, and a saline purge every day or two. A series of blisters may also afford some relief. See HEART-DISEASE, NEPHRITIS.

LIVER, EXAMINATION. Boundaries.—The liver is the largest gland in the body, weighing from 3 to 4 pounds. Its upper portion is convex and directed upward and forward; it is smooth and covered with peritoneum. The *upper* surface is in immediate relation with the under surface of the diaphragm. Its *under* surface is concave, directed downward and backward, and in relation with the stomach, duodenum, hepatic flexure of the colon, right kidney, and suprarenal capsule. The upper surface of the liver is divided into 2 unequal lobes—the right and the left.

The right lobe of the liver occupies the right hypochondrium, the upper border anteriorly extending from the base of the ensiform cartilage on the median line, in the fifth intercostal space on the right nipple-line, in the seventh intercostal space in the axillary line, and posteriorly below the base of the right lung, about the level of the tenth rib or dorsal spine. The lower border of the right lobe normally should not extend below the free margin of the ribs.

The left lobe of the liver occupies the epigastric region, extending 2 inches to the left of the median line, the lower margin usually being found immediately overlying the stomach and about 3 inches below the ensiform cartilage. The left lobe is in close relation with the heart, being separated from that organ through the medium of the diaphragm.

Inspection.—By this method of diagnosis we detect general jaundice and enlargement in the right hypochondrium. Bulging may be present in hydatid cyst and distended gall-bladder. Jaundice is present in catarrhal jaundice, biliary calculi, cancer, hypertrophic cirrhosis, acute yellow atrophy, and occasionally in acute hepatitis.

Palpation.—The patient should be in a dorsal position, with the shoulders elevated and the knees drawn up.

The liver is enlarged and smooth in amyloid disease, fatty liver, congestion of the liver, hypertrophic cirrhosis, and multiple abscesses. It is enlarged but uneven in hydatid tumor, single abscess, and cancer.

Palpation detects pain which is present in acute congestion, catarrhal jaundice, biliary calculi, abscess, and cancer. Edema may be present in the right hypochondrium in hepatic abscess. Fluctuation may be detected in hydatid cyst and distended gall-bladder, and occasionally in abscess of liver.

The liver is diminished in size in atrophic cirrhosis and acute yellow atrophy.

Percussion.—The patient should be placed in a dorsal position. By percussion the size of the liver is obtained. The upper boundary of the organ is determined by first gently tapping over the right nipple to detect the lung resonance, then gradually going downward until the upper edge of the liver is found. In the axilla the same method is pursued. The upper boundary of the right lobe in the nipple-line will be found in the fifth intercostal space, in the axillary line in the seventh interspace, and posteriorly on a line with the tenth rib or tenth dorsal spine. The lower border of the liver extends to, but not beyond, the free margin of the ribs anteriorly. The left lobe of the liver may often be outlined by gentle percussion. The upper border is inseparable from the dulness of the heart. The lower border lies about 2 inches to the left of the median line, and extends downward midway between the ensiform cartilage and the umbilicus.

Examination in Children.—Douchez says: The exact determination of the borders of the liver in children is difficult, because of the involuntary contraction of the muscles, also on account of the resonance found over the thin lower edge and of the oblique position of the upper border.

The measure of dulness of the anterior face of the liver, in the living, is almost always less by 1 or 2 centimeters than the real measure on the cadaver, either before or after opening the abdomen; we should, therefore, estimate this dulness from its extreme limits, in order to reach as nearly as possible the truth.

The upper border of the liver corresponds in general to the interval between the fifth and sixth ribs.

In the healthy state, the vertical measurements increase almost regularly with each year's growth, excepting in certain individuals.

The liver was found somewhat large in cases of catarrhal jaundice and gastric disturbance; large in cardiac disease; very large with amyloid liver, syphilitic liver, fatty liver, and hydatid cysts.

The slightest disturbance of health may cause a variation of 2 to 4 centimeters, and a variation of 3 to 10 centimeters was found with certain grave lesions.

LIVER, HYDATID CYST. Etiology and Pathology.—Hydatid cysts are formed by the larvæ of the tænia echinococcus of the dog. This tape-worm is exceedingly small, provided with 4 sucking discs and a double row of hooklets (Osler). The eggs usually gain entrance through the mouth, and after the shell has become detached, the embryo is set free, and, becoming attached to the intestinal wall, may burrow its way to the external surface. It probably gains entrance to the liver through the medium of the portal vein. After a certain time the embryo develops into a cyst with two layers—the internal (breeding) or granular layer, and the external (dense) or laminated layer. Daughter cysts spring from the inner or granular layer; hence the process is a continuous one. The daughter cysts may be set free; hence there may be hundreds within the primary cyst. The investing membrane of the smaller growths is soft, thin, and gelatinous, containing a clear, nonalbuminous fluid of specific gravity 1005–1007, rich in chlorids and containing glucose.

Symptoms and Clinical Course.—In the early stages no symptoms are produced. Later, as the cysts multiply and the fluid accumulates, there is an irregular enlargement of the liver, producing a dragging sensation in the right hypochondrium, dyspnea, and palpitation of the heart. Fever and pain are only present if there is suppuration of the cyst.

Jaundice is generally absent, but may result if pressure is great enough to cause occlusion of the biliary ducts. Percussion over the area yields a vibratory or trembling movement. By aspiration the clear-colored fluid is obtained.

Complications.—Suppuration, metastasis to various organs, as lung, pleura, brain, spinal canal, and genitals.

Diagnosis.—See LIVER (Abscess).

Prognosis is unfavorable as to medicinal treatment. Surgical interference yields favorable results.

Treatment is purely surgical. See LIVER (Abscess).

LIVER, INJURIES.—See ABDOMEN (Wounds and Injuries), GUNSHOT WOUNDS.

LIVER, PERIHEPATITIS.—Inflammation of the peritoneal covering of the liver.

Etiology.—(1) Extension, by continuity, of hepatic inflammation; (2) extension of pleurisy, by contiguity; (3) secondary to ulcer of stomach, etc.; (4) as part of a general peritonitis.

Pathology.—In the acute type there is fibrinous or purulent exudation with formation of adhesions. Thus, between the liver and diaphragm a pocket filled with pus may be formed, *i. e.*, a subphrenic abscess.

In the chronic form the capsule of the liver is thickened, especially at the hilum, with stenosis of the blood-vessels and bile ducts, and shrinkage of the liver, while adhesions to neighboring organs may occur.

Symptoms.—None are characteristic; often it is unsuspected in life. Sometimes the symptoms resemble atrophic cirrhosis. Physical examination may disclose a friction-rub over the liver or epigastrium. If there is purulent exudation, symptoms, and signs of sepsis manifest themselves.

Diagnosis.—It is to be distinguished from an empyema by the early symptoms, which are abdominal rather than thoracic and accompanied by further downward displacement of the liver. Aspiration may be resorted to, and it is said that the spurting of the released fluid is synchronous in subphrenic abscess with inspiration, in empyema with expiration. The nonpurulent form is rarely recognized until death.

Prognosis is grave in the suppurative form.

Treatment.—Before pus formation, bed, light diet, counterirritation by cupping or leeching, hot compresses, sinapisms are indicated. Surgery is necessary as soon as pus is manifest.

LIVER, SARCOMA.—Sarcoma of the liver is rare. In 1908, Knott was able to collect from the literature only fifty-nine cases in which it occurred as a primary lesion. It may occur at any time of life from infancy to old age. The tumor grows rapidly and constitutional symptoms soon develop. It is practically impossible to differentiate sarcoma from carcinoma when the disease affects a person in middle or advanced life. Unless the neoplasm is distinctly circumscribed no attempt should be made to remove it.

LIVER, SYPHILIS.—Syphilis of the liver is usually a tertiary lesion, although it may occur early in the secondary stage, as an acute diffuse low grade inflammation, causing considerable enlargement of the gland, and sometimes giving rise to jaundice. The prognosis of this form is usually good, active mercurial treatment bringing about complete resolution.

Tertiary syphilis may affect the liver either as an interstitial inflammation or in the form of single or multiple gummata. Interstitial hepatitis is similar to atrophic cirrhosis in many respects. The cellular infiltrate is changed into connective tissue which compresses the ducts and blood-vessels, with resulting atrophy of the hepatic cells.

Gummata are usually multiple and vary greatly in size.

For both tertiary forms of the disease large doses of potassium iodid together with mercurial inunctions or injections should be given. Gummata not relieved by such treatment have been excised or fixed to the abdominal wall, the interior scooped out and a strip of gauze inserted (Spencer and Gask).

LOBELIA.—The leaves and tops of *L. inflata*, an expectorant, diaphoretic, purgative, antispasmodic, and emetic; in larger doses a motor depressant and narcotic. It contains gum, resin, fixed oil, wax, lignin, salts of calcium, potassium, and iron, a liquid alkaloid, *lobelin*, also *lobelic acid*, and *lobelacrin*. Dose, 2 to 15 grains.

Lobelia has an acrid, nauseous taste, and heavy, unpleasant odor. It strongly resembles tobacco in its action. It is useful in paroxysmal spasmodic asthma, as well as in dry cough with constant tickling in the throat. As an enema in strangulated hernia, the infusion is safer than tobacco, and as efficient. In constipation from atony and deficient secretion, 10 minims of the tincture at bedtime will be found to act well.

In asthma:

℞.	Tincture of lobelia,	℥ ss.
	Anise water,	℥ ij
	Water,	℥ iv.

Give one-sixth part for a dose.

Preparations.—Fluidextractum L. Dose, 1 to 15 minims. **Tinctura L.**, 10 percent. Dose, as expectorant 5 to 20 minims; as emetic 1/2 to 2 drams. **Infusum L.**, ℥j to a pint. Dose, 1 to 8 drams.

LOCHIA.—The bloody, serous discharge from the uterus after labor. For the first 4 or 5 days it is bright red in color (*lochia rubra*), and composed chiefly of blood. During the next few days it becomes lighter in color (*lochia serosa*), and is composed of some blood, pus, mucus, and serous discharge. Finally it becomes white or yellowish (*lochia alba*), and resembles an ordinary vaginal leukorrhea. The flow ceases entirely at the end of 3 to 6 weeks.

The amount of the flow varies considerably in different individuals and at different times. Ordinarily, 4 to 6 napkins are saturated in the 24 hours for the first 3 or 4 days; after that the number varies from 1 to 3 until the ninth or tenth day, when the discharge becomes so slight as not to require a protective.

The odor of the normal lochia is bloody or musty; should it become offensive, decomposition and, probably, sepsis have occurred.

LOCKJAW.—See TETANUS.

LOCOMOTOR ATAXIA (Tabes Dorsalis; Posterior Spinal Sclerosis).—Posterior spinal sclerosis is perhaps the preferable designation for the affection under consideration, because the most constant and the most conspicuous lesion is essentially that which this name describes. Although the disorder is the most common and the most important of the diseases of the spinal cord, it has been well recognized and differentiated only during the past sixty years. It is probable that the affection described by Hippocrates as tabes dorsalis was what we at present know as neurasthenia. The earliest exact account of posterior spinal sclerosis was given by Todd in 1847; and Türck, in 1856, was the first to describe the alterations in the cord; but the disease was given the prominence it merited through the efforts of Romberg and Trousseau in 1858. The symptoms and the pathology have since been elaborated to the utmost refinement, and the disorder is one of the best known in medical nosology.

Pathologic Anatomy.—The essential lesion is a more or less extensive degenerative process, of varying intensity, involving the paths for conducting sensory impressions, which is most pronounced and most conspicuous in the posterior nerve-roots and the posterior columns of the spinal cord. Macroscopically, the degenerated portions of the cord appear grayish or slightly pinkish and translucent, and somewhat depressed below the common level. The overlying pia mater may be turbid and slightly thickened. The differentiation between diseased and healthy structure is brought out more vividly by staining.

On microscopic examination the disease is found to begin on either side in the posterior nerve-roots, and to extend into the posteroexternal columns of Burdach, while at higher levels the posterointernal columns of Goll are also involved. A small area in the posterior columns, adjacent to the posterior commissure, invariably escapes, while an oval area, adjacent to the posterior median fissure, and a comma-shaped zone included between the columns of Burdach and those of Goll, remain long intact.

Histologic study shows the axis-cylinders to have disappeared from the degenerated areas partially or wholly, while the glia remains or has even undergone hyperplasia. The walls of the blood-vessels in the affected portions are thickened. The disease of the spinal cord is not confined to the white matter. In addition to the posterior roots the posterior vesicular columns of Clarke, the marginal zone of Lissauer, and the medullary bridge of Weigert also suffer sometimes. Further, the degenerative process may involve the ganglia of the posterior spinal nerves, whose medullated fibers and ganglion cells may be in part destroyed. Peripheral sensory nerves also have, in a number of instances, been found diseased. Sometimes, too, the cerebral nerves and the nuclei situated in the medulla oblongata participate in the degenerative process. The morbid process usually begins, and is most common and most pronounced, in the dorsolumbar region of the cord, but a cervical and a cerebral type of the disease are also sometimes described.

Etiology.—Posterior spinal sclerosis is a disease of middle life, one-half of the cases occurring between 30 and 40 years, and almost all between 20 and 50 years. It is exceedingly uncommon in early life, and it rarely begins in late life. It is more common in men than in women, in the proportion of about 10 to 1; and in the larger cities than in the smaller towns. It is rare in negroes, if it occurs at all in the full black. Heredity, direct and indirect, exerts but little, if any, etiologic influence. The most potent, though scarcely the sole, cause is syphilis, albeit it must be borne in mind that even then the lesions themselves are not syphilitic. Among additional, though far less important, etiologic factors, are other infectious and toxic processes, exposure to wet and cold, traumatism, and excesses of various kinds. A long interval—from 5 to 20 years—often elapses between the incidence of the causative condition and the appearance of the first symptoms of the spinal disease, though cases have been reported in which the separation has been as short as 1 year and as long as 20 years respectively. Hereditary syphilis has been the antecedent condition in a small number of cases. The disease, further, is occasionally observed in the sequence of other affections of the spinal cord: *e. g.*, myelitis, gumma.

Duration and Course.—Posterior spinal sclerosis is essentially a chronic and progressive disease. It is often insidious in onset, and it may advance slowly. Not rarely there are remissions, sometimes with long stationary periods. Occasionally, the disease pursues a relatively acute course. Once established, however, recovery is out of the question. The duration is, as a rule, protracted, and may cover many years. The disease is not fatal of itself, death resulting from complications or intercurrent disease. Its course may be divided into three periods: (1) neuralgic; (2) ataxic; (3) paraplegic.

The prognosis is relatively favorable as to life, but distinctly unfavorable with regard to recovery, although arrest of the disease may take place at any stage.

Symptomatology.—The symptoms of posterior spinal sclerosis concern especially and almost exclusively the sensory functions of the nervous system, and they may represent any degree of disturbance, from mere diminution to absolute loss. Among the earliest are shooting pains in the thighs, the so-called **lightning** or **lancinating pains.** These usually occur in paroxysms of varying duration (from hours to days), at longer or shorter intervals (from days to months). The pains may be boring, tearing, cutting, or burning, and they are sometimes present in the upper extremities, and rarely in other portions of the body. Possibly allied to these, although commonly they occur at a later period of the disease, are the painful paroxysmal seizures known as **crises**: laryngeal, pharyngeal, cardiac, gastric, intestinal, rectal, anal, hepatic, renal, vesical, vaginal, etc.

Laryngeal crises are characterized by a sense of constriction of the throat, with great distress and choking; pharyngeal crises by dysphagia and regurgitation of food; cardiac crises by intense precordial pain and other symptoms of angina pectoris; intestinal crises by tormina and tenesmus and burning pain; gastric crises by intense epigastric pain, with vomiting, flatulence, eructation, hiccup, and consequent wasting; hepatic crises by symptoms of biliary colic; and renal and vesical crises by those of calculus or colic.

Sensibility is often deranged in other directions. Most commonly its acuity is diminished—hypesthesia; sometimes it is lost—anesthesia; occasionally it is heightened—hyperesthesia. Often sensory conductivity is retarded or delayed. Abnormal sensations are frequently present—paresthesias—as of numbness or tingling, formication, of crawling or creeping, of cold or of burning, of running water, etc. A not uncommon symptom is a feeling of constriction or a sensation as of a band, rope, or cord about the waist, the so-called girdle-sensation. Some patients cannot distinguish the density of the surface on which they walk. In addition to alterations of common sensibility, changes in other varieties of sensory perception may be present, as of the sense of weight or of pressure, of position, of pain, of temperature, of localization.

Another early symptom is want of muscular coordination—**ataxia.** This is most common and usually most pronounced in the lower extremities, and is responsible for the unsteadiness in walking and standing. When it affects the upper extremities, it renders difficult, if at all possible, the performance of fine, delicate movements with the hands. In standing the patient holds his feet far apart, or keeps his eyes fixed upon the ground. If the feet are brought in juxtaposition, or if the guidance of the eyes is removed, or both, the patient will sway, and he might fall if not supported. The gait is staggering, not unlike that of a drunken man, and walking in the dark or backward is difficult or impossible; the feet are raised high from the ground, thrown somewhat outward, and permitted to fall awkwardly. Fatigue is induced with undue readiness. Sometimes associated movements take place, a voluntary muscular act in one part of the body being accompanied by a like involuntary act in the corresponding members of the opposite side, or even by a movement in some unrelated and perhaps remote part.

While muscular coordination suffers in varying degree, muscular power and muscular nutrition. and the response of the muscles to electric stimulation, remain practically unaltered, except when, late in the disease, they are affected in consequence of disuse.

With the ataxia there is usually associated inequality or enfeeblement or **absence of the knee-jerks,** while the cutaneous reflexes are altered in accordance with the changes in cutaneous sensibility. When the cervical portion of the cord is affected, the deep reflexes in the upper extremities suffer, while the knee-jerks may be preserved. **The reaction of the pupils** to light stimulation is generally impaired early—reflex iridoplegia—although their contractility in accommodation and in convergence is, as a rule, preserved throughout (Argyll Robertson phenomenon). Reflex dilatability from stimulation of the skin of the neck may also be diminished or lost. The pupils are usually small, and may be unequal, though sometimes they are large.

Paralysis of one or more ocular muscles is a common symptom, from which not rarely recovery takes place; and at times there is more or less **ophthalmoplegia,** internal as well as external. In this way there will result strabismus, diplopia, ptosis, paralysis of accommodation, etc.

Optic atrophy, of varying degree and unilateral or bilateral, occurs in many cases and is responsible for the blindness present. Impairment or loss of hearing or of smell or of taste is occasionally observed. Symptoms of involvement of the medullary nerves or their nuclei are not rarely noted. Retention of urine may result from insensibility of the mucous membrane of the bladder, and incontinence from the same cause, or from overflow, or in consequence of weakness of the sphincter vesicæ. Cystitis may develop and lead in turn to ureteritis and pyelitis. The sphincter ani is generally competent, and constipation is the rule. Sexual desire and sexual potence are often diminished and sometimes entirely lost, perhaps in the train of satyriasis. Some cases are marked by drowsiness and lassitude.

Various vasomotor, secretory, and trophic disturbances have been observed in individual cases: *e. g.*, hyperemia, hyperhidrosis or anidrosis, epiphora, sialorrhea, polyuria, glycosuria, diarrhea, ecchymoses, purpura, urticaria, herpes, ichthyosis, loss of nails, painless loss of teeth, bed-sores, perforating ulcer of the foot, gangrene of the toes, spontaneous laceration of the fibers of tendons, and spontaneous fracture of bones. Sometimes morbid alterations take place in one or more joints—arthropathies—the synovial sac filling with fluid and the articular cartilage and adjacent bone undergoing atrophic or hyperplastic changes. The foot may become thickened and deformed from alterations in joints, tendons, and muscles. Atheroma or arteriosclerosis not rarely attends posterior spinal sclerosis, and it may engender obstruction at the aortic orifice and incompetency of the aortic valves, with systolic and diastolic murmurs at the base of the heart on the right side. Rarely there are symptoms of degeneration of cerebral or spinal motor nerves, resulting in facial or lingual hemiatrophy, paralysis of the diaphragm, and weakness and wasting of other muscles. In some cases, also, symptoms of progressive paralysis of the insane are superadded. Finally, apoplectiform and epileptiform seizures and hemiplegia have been observed.

Diagnosis.—The recognition of posterior spinal sclerosis is to be based on the lightning pains, the unsteadiness of gait and station, the want of coordination in the upper extremities, the diminution or loss of knee-jerks, the narrowing of the pupils and their immobility on exposure to light, the ocular palsies, the optic atrophy, the sensory disturbances, the loss of sexual desire and sexual vigor without psychic manifestations, muscular weakness and wasting, and changes in electric reactions.

The spinal disease is to be differentiated from **multiple neuritis** by its insidious rather than acute onset, by the presence of visceral symptoms (incontinence of urine, impotence, crises), of lightning pains, of girdle-sensation, of optic atrophy rather than neuritis, often by the absence of nerve tenderness, and of muscular weakness and wasting.

Posterior spinal sclerosis may bear a close resemblance to **syphilis of the spinal cord,** but with the latter the clinical picture is likely to be atypical, while the knee-jerks may be present and even exaggerated, headache and papillitis are more commonly present, and other symptoms of syphilis may be more or less obvious.

Cerebellar tumor may present many of the symptoms of posterior spinal sclerosis, but lightning pains are likely to be absent, the knee-jerks are variable (sometimes absent, sometimes present), vesical symptoms are wanting, severe and persistent headache is a usual symptom, and papillitis, rather than optic atrophy, occurs.

Treatment.—While the lesions of posterior spinal sclerosis are little amenable to treatment, much can sometimes be done by judicious management to mitigate the severity of the symptoms, and possibly to prevent the advance of the disease. Of primary importance is the maintenance of the general health, the avoidance of intercurrent disorders, and the prevention of complications. If there is a history of syphilis or evidence of that disease, with the possibility of inadequate specific treatment, mercury (by inunction, by hypodermic injection, by internal administration) or iodids (sodium, potassium, strontium, lithium, hydriodic acid) or both may be administered within the limits of tolerance. Either or both of these remedies may also be tried carefully in the absence of syphilis. Subcutaneous injections of testicular extract, prepared according to the method of Brown-Séquard (d'Arsonval); are attended with marked improvement in some cases. Among other drugs that have been used are salts of iron, of zinc, of arsenic, of silver, and of gold, strychnin, belladonna, ergot, quinin, and phosphorus. Lancinating pains and crises may require the administration of antiyprin, acetanilid, phenacetin, sodium salicylate, codein, or even of morphin. The faradic brush may also be employed to relieve pain, as may likewise anodal application of the galvanic current and the static spark. A good deal has been claimed in this connection for the sinusoidal current, but the hopes raised have not been generally realized. Suspension of the body from the head, in order to exert traction upon the spine, has been practised at different times for many years, and in some cases with encouraging results. Overextension of the spine by raising the feet of the recumbent patient over his head, with flexion of the trunk, has also been employed with the same object. Rather a more promising mode of procedure than any of those yet mentioned consists in courses of gymnastics calculated to improve and restore the failing coordination. The patient is systematically instructed and trained in the most varied movements, from the simplest to the most complex, in this way retaining the faculties of all the nerve-fibers whose functions have not been lost by destruction of their axis-cylinders. All forms of exercise should, however, be kept within the limits of fatigue. Massage and baths are capable of maintaining the general nutrition, to which, further, a proper diet and a suitable mode of life should be directed. Cystitis is to be avoided, so far as possible, and extension of inflammation to the pelvis of the kidney prevented; and the formation of bed-sores is to be guarded against. Arthropathies may require surgical or orthopedic treatment.

LOGWOOD.—See Hematoxylon.

LORDOSIS.—See Spine (Curvature).

LOTION.—A solution or mixture of medicinal agents intended for external application. It usually consists of some soluble astringent salt dissolved in water, with perhaps some glycerin or alcohol. A *fomentation* is a similar preparation used hot. A *collyrium* is an eye-wash, and generally contains a soluble astringent salt, dissolved in rose-water or distilled water, in the proportion of 1 to 4 grains to the ounce. The only official preparation suitable for a lotion is **lead-water.**

Black lotion or wash is prepared by adding calomel, 30 grains, to lime-water, 10 ounces, producing the black oxid. It is used as an application to syphilitic sores. **Goulard's lotion** contains liquor plumbi subacetatis. See Liquor. **Yellow lotion** or wash is prepared by adding mercuric chlorid, 18 grains, to lime-water, 10 ounces, producing the yellow oxid. It is a favorite application for syphilitic sores.

LOZENGES.—See Troches.

LUCID INTERVALS.—These may occur in the course of a mental disease, and are defined by Bucknill and Tuke as not consisting in a mere cessation of the violent symptoms of the disorder; but as intervals in which the mind, having thrown off disease, has recovered its general habit. The party must be capable of forming a sound judgment of what he is doing, and his state of mind such that any indifferent person would think him capable to manage his own affairs.

LUDWIG'S ANGINA.—An acute cellulitis, usually of streptococcic origin, which begins in the region of the submaxillary gland, spreads along the connective tissue planes of the neck and involves the floor of the mouth and walls of the pharynx. It generally occurs during an infectious disease but may be due to traumatism or carious teeth. The neck becomes swollen and indurated and the mouth and throat very much inflamed. As a rule the onset is sudden, but the characteristic violent local and general symptoms may be preceded for a few days by localized swelling and tenderness of the submaxillary gland. Edema of the glottis may cause sudden death or fatal septic pneumonia; pleurisy or pericarditis may occur if the morbid process extends to the mediastinum.

Treatment consists of free multiple incisions, the removal of necrotic tissue, cauterization with carbolic acid and iodin, drainage-tubes and hot moist dressings. Stimulants should be given freely and antistreptococcic serum injected whenever it can be obtained.

LUMBAGO.—A form of muscular rheumatism affecting the muscles of the loins and their tendinous attachments. It is one of the most common and painful forms of rheumatism. It is most frequently found among workmen. Its onset is sudden, and in very severe cases it completely incapacitates the sufferer, and he may be unable even to turn in bed or arise from a sitting posture. As a rule, it is a transient affection, lasting from a few hours to a few days. It may be constant in character or occur only when the muscles are drawn into certain positions. Instead of being painful, it may take the character of a simple ache, which is relieved by pressure.

Treatment.—Rest of the affected muscles is of the first importance. Porous plasters are believed to be efficacious by the public. A hypodermic injection of morphin into the affected muscles will relieve the severe and agonizing pain. Acupuncture, in acute cases, is a most effective treatment. Sterilized needles, 3 or 4 inches in length, may be thrust into the lumbar muscles at the seat of pain, and after 5 to 10 minutes withdrawn. The relief is often immediate. The constant current is sometimes beneficial. The thermocautery may be employed in light strokes over the affected muscles. Blisters may be tried in obstinate cases. Hot fomentations are soothing, and, at the outset, a Turkish bath may cut short the attack. In chronic cases potassium iodid may be used, and guaiacum and sulphur have been strongly recommended. Proper clothing and diet are needed. Large doses of nux vomica are sometimes beneficial. See Rheumatism.

LUMBAR PUNCTURE.—Spinal (subarachnoid) puncture is used for anesthesia, and it has become a measure of marked value both for diagnosis and treatment. Tapping of the spinal theca may be practised readily and with impunity, provided perfect asepsis be observed, in any interlaminal space between the second lumbar and the first sacral vertebræ. It has been found valuable in diminishing intracranial pressure, as, for instance, in tuberculous meningitis. Great benefit has been derived from it in uremic convulsions. Lumbar puncture should be performed in cases of doubtful infantile paralysis. It is the only means available at present of differentiating between epidemic meningitis and that form of anterior poliomyelitis which resembles it so closely. In tetanus magnesium sulphate and tetanus serum are administered by injection following lumbar puncture; similarly antimeningococcus serum is given in epidemic cerebrospinal meningitis. See INTRASPINAL ANESTHESIA, MENINGITIS.

LUMBRICOIDS.—Large round-worms (*Ascaris lumbricoides*) infesting man and animals. See WORMS (Round).

LUNACY.—A popular name for insanity, so called from the traditional belief that it was influenced by the moon. For the divisons and legal aspect of insanity see INSANE (Laws Relative), INSANITY. See also DELIRIUM, MANIA, MELANCHOLIA, etc.

LUNGS, CIRRHOSIS (Chronic Interstitial Pneumonia).—A chronic inflammatory disease of the lungs, characterized by an overgrowth of the connective tissue.

Etiology.—(1) Sequel of croupous pneumonia; (2) fibroid phthisis; (3) fibrinous pleurisy; (4) bronchopneumonia; (5) inhalation of dust—pneumoconiosis; if due to stone-dust—chalicosis; to coal-dust—anthracosis; metallic dust—siderosis.

Pathology.—The disease is generally unilateral, the chest on the affected side being retracted and the heart displaced. The lung is greatly atrophied, only leaving the interstitial tissue, and is frequently so shrunken that its contour is totally changed. If due to tuberculosis, cavities may be found. Microscopically, an overgrowth of connective tissue is seen. The unaffected lung is in a condition of emphysema.

Symptoms and Clinical Course.—There is a severe cough, accompanied by slight or profuse expectoration, mucopurulent in character. On account of the diminished size of the lung dyspnea is a common symptom. Fever may be absent, and the health remain good for many years. If due to tuberculosis, pulmonary hemorrhages are common.

Physical Signs. Inspection.—There is retraction of the chest on the affected side. The apex-beat is displaced.

Palpation.—Vocal fremitus may be diminished or increased, depending upon involvement of the pleura.

Percussion shows impaired resonance on the affected side, and hyperresonance on the opposite side.

Auscultation.—There is heard cavernous or amphoric breathing at the apex, but feebler at the base of the lung, with large and small mucous râles.

Diagnosis.—The affection has to be distinguished only from TUBERCULOSIS (*q. v.*).

Prognosis.—It is fatal in from 10 to 15 years.

Treatment is palliative. A change of occupation and out-of-door gymnastics may be demanded. See TUBERCULOSIS.

LUNGS, CONGESTION.—An increase in, or abnormal fulness of, the capillaries of the air-cells: *active*, when the result of an accelerated circulation; *passive*, when caused by an impeded outflow from the capillaries. For etiology, diagnosis, and treatment, see HEMOPTYSIS.

LUNGS, CONSUMPTION.—See TUBERCULOSIS (Pulmonary).

LUNGS, EDEMA.—An exudation of serum into the pulmonary interstitial tissue and the alveoli of the lungs, characterized by dyspnea, cough, and a frothy, blood-streaked expectoration.

Etiology.—Pulmonary edema is the result of stasis, occurring when the outflow of venous blood in the lung meets an obstacle that cannot be overcome by the right ventricle, as in cardiac diseases in which the left ventricle fails. It also follows Bright's disease and alcoholic excesses, causing cardiac depression and lung inflammations.

Pathologic Anatomy.—The lung tissue is swollen, and does not collapse when the chest is open. The elasticity of the tissue has disappeared, and it pits upon pressure. If following congestion of the lungs, the color is red; if a symptom of general dropsy, its color is pale. On cutting into the edematous spots an enormous quantity of albuminous fluid, sometimes clear, at other times of a red color, mixed more or less with blood, flows over the cut surface.

Symptoms.—The preeminent symptom is dyspnea, the breathing being hurried, labored, and rattling, all the accessory muscles of respiration being called into action. The sense of oppression and anxiety is extreme. There is also a constant, harassing, short cough, and the expectoration of a blood-streaked, frothy mucus. The action of the heart may be tumultuous or feeble. The face is at first flushed, but as the left ventricle fails, or if the effusion into the air-cells is sufficient to prevent the entrance of air, symptoms of cyanosis rapidly supervene, the pulse becoming feeble, the surface cold, the breathing shallow and hurried, the cough suppressed, stupor replacing the restlessness, soon deepening into coma.

Percussion.—If there is no other lung-disease, the percussion-note is but slightly, if at all, impaired.

Auscultation.—The vesicular murmur is lost by the diffused subcrepitant and bubbling râles.

Diagnosis.—Acute pneumonia in the earlier stages is the only condition likely to be confounded with edema of the lungs, but as the two diseases progress, the picture of pulmonary edema is so characteristic that it cannot be mistaken.

Prognosis is grave, and particularly if the disease occurs in pneumonia, heart-disease, or Bright's disease. In the majority of instances it is a terminal symptom, coming on in all forms of acute and chronic diseases.

Treatment.—As a rule, remedies are useless. The indication is to stimulate the left heart, and this is best done with hypodermic injections of strychnin sulphate, 1/24 grain, repeated every half hour; citrated caffein, 3 to 5 grains; spartein sulphate, 1 to 2 grains every hour or two, or digitalin, 1/60 to 1/30 grain, repeated every hour or two. Two or more of these drugs may be advantageously combined. Atropin sulphate, 1/60 to 1/100 grain, and ergot in some form are valuable remedies. Occasionally relief follows a free venesection or the application of wet cups. Alcoholic stimulants are often invaluable. These means may be aided by counterirritation to the chest, hot mustard foot-baths, active saline purgatives, and diuretics.

LUNGS, EXAMINATION.—See CHEST (Examination).

LUNGS, HEMORRHAGIC INFARCTION (Pul-

monary Apoplexy).—An effusion of blood into the air-cells and interstitial tissue of the lungs.

Etiology.—It is usually the result of an embolus which comes from the heart or from a thrombus in the pulmonary artery. The smaller vessel becomes dilated after the embolus lodges, and from the effect of the blood-pressure the vessel ruptures, giving rise to the condition.

Pathology.—The infarction is usually in the periphery of the lung and of a conic shape—the base toward the pleura, the apex toward the root of the lung. The red patches of infarction are clearly seen on the pleura. The infarction, when cut, collapses readily.

Symptoms.—These are of an indefinite nature. Naturally, there is dyspnea, and if there is a valvular disease of the heart with expectoration of dark blood, a blowing breathing at the lower lobes, and dulness on percussion, we may suspect pulmonary apoplexy.

Treatment should be directed to the cause. The prime indications are to bring down the blood-pressure with such drugs as aconite, in doses of 3 to 6 drops of the tincture every 3 or 4 hours, and to reduce the frequency of the pulse-beat by avoiding excitement, and the applications of ice-cloths over the chest for periods of 10 minutes. A hypodermic of 1/4 of a grain of morphin is often the best thing to prevent excitement and danger of further hemorrhage.

LUNGS, INFLAMMATION.—See PNEUMONIA, TUBERCULOSIS, PLEURISY.

LUNGS, INJURIES.—Injuries of the lungs may occur from mere contusion or compression of the thorax; they are very common as a result of fractures of the ribs; and occasionally they occur as a result of external wounds, penetrating from the outside. The wound may be superficial or deep; it may be punctured, incised, or lacerated, with or without the entrance of foreign bodies, and it may be so trivial that it is never diagnosed, or it may cause instant death. The simpler forms of wound heal at once by first intention, without any inflammation, and with very great rapidity. Severe contusion, owing to the extravasation into the air vesicles, is attended with a greater amount of consolidation and with rusty, blood-stained sputum for several days, but the dulness rarely extends, and there is little or no fever. If, however, the extravasation is very great, or there is an external wound, so that the blood decomposes, intense septic pneumonia, and even gangrene, may follow; but there is always such an amount of pleural effusion, and the lung, as a rule, in these cases is so collapsed and compressed against the back of the thorax, that the physical signs are very obscure.

Symptoms.—The two characteristic signs of wound of the lung are hemorrhage and the escape of air. The former may take place into the bronchi, so that the sputum consists either of pure blood or of a frothy, bright-red mixture, which in a day or two becomes rusty and black; or it may collect in the cavity of the pleura (hemothorax), and gradually soak into the surrounding tissues, so that the skin on the loins becomes dark and ecchymosed; or it may escape externally, mixed with air, or almost pure. So with the air. In very rare instances, when the vesicles alone are torn without the pleura being injured, it may escape into the cellular tissue of the lung and make its way along the outside of the bronchi into the mediastinum, and so gain the root of the neck; or it may collect in the pleural cavity, entering at each expiration, until it distends the thorax to its utmost and compresses the lung against the back; or, what is far more common, without entering the pleura at all, it finds its way across into the cellular tissue, and gives rise to surgical emphysema; or, finally, if there is a large open wound, it is sucked in and out of the chest at each respiration, mixed more or less with blood.

Beside these, other symptoms are usually present. The shock of such an injury is severe and sometimes fatal, even when the amount of bleeding is not great; anxiety and distress are always marked; sometimes the dyspnea is slight, but usually it is severe, and if the lung becomes rapidly collapsed, it may be extreme; there is a constant sense of irritation and tickling in the throat, with an intense desire to cough, but the deep, fixed pain in the chest prevents it, and if the hemorrhage is severe, the patient may sink rapidly into a state of collapse.

Treatment is directed to control of the hemorrhage by compression and the use of hemostatics, fixation of the chest, and general supportive measures. See HEMOPTYSIS.

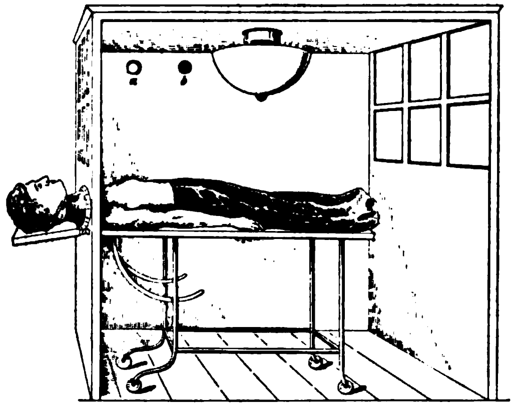
Pneumatocele, hernia, or **prolapse of the lung** is an occasional but rare complication of injuries of the thorax. It may be either immediate or secondary. In the former case there is generally a wound of some extent in the parietes, and the lung is forced out through it by a violent effort at expiration when the glottis is closed. It may be injured itself or it may not, but as soon as it is squeezed out through the rent, it expands so that it cannot return, and rapidly becomes congested. In extreme cases it may be strangulated. If seen shortly after the accident, an attempt may be made to return the protrusion, and, if necessary, the wound may be slightly enlarged for the purpose; but if some time has elapsed, and the tissue is very much congested, it is better left where it is to slough off and granulate over; or its separation may be assisted by ligature or actual cautery. A very few instances are recorded in which, owing to extensive injury of the thorax, an immediate prolapse of the lung has occurred without an external wound.

The consecutive variety may not make its appearance until some considerable time after the receipt of the injury, and if there has been a wound, it must have healed first. It forms a soft, circumscribed tumor, projecting through the wall of the thorax under the skin, swelling out on expiration and shrinking on inspiration. On coughing there is a distinct impulse; if it is pressed upon, it collapses readily, with a feeling of soft crepitation, and the margins of the opening can be plainly felt. It is resonant on percussion, and the respiratory murmur is loud and coarse in comparison.

In some cases it is the result of extensive rupture of the intercostal muscles; in others, where its formation is very gradual, it is probably due to chronic inflammation weakening the walls of the thorax at one spot, and allowing the lung slowly to force its way through. The only treatment required is a belt or truss, according to the size and situation of the protrusion, to restrain it and protect it from injury.

For further discussion of injuries of the lung, see CHEST (Injuries), PLEURA, PLEURISY, PNEUMONIA.

LUNGS, SURGERY.—The dangers of intrathoracic surgery have been lessened by the ingenious methods devised for preventing collapse of the lung when the pleura is widely opened. Both positive and negative pressure are employed. The former prevents collapse of the lung by distending it from within, the latter by making suction upon its exposed surface. When positive pressure methods were first introduced, and for sometime thereafter, they were assailed as being dangerous, but evidence based upon continued animal experiments and also upon the results of their application to the human subject, show that the objections were theoretical rather than practical. Kuttner, Dreyer, Robinson and others have demonstrated that the air exchange in the trachea, the venous pressure, the aortic and pulmonary pressure, and the expansion of the thorax are the same under positive pressure as they are under negative pressure.



SAUERBRUCH'S PNEUMATIC CABINET.

a. Opening of pipe connecting with suction pump; *b*, valve to let in air, and regulate the negative air pressure. —(Bryant and Buck's *American System of Surgery*.)

With regard to the apparatus employed, that for positive pressure is simpler than that for negative. Robinson and Leland state that the requirements of any positive pressure apparatus are a supply of compressed air; an anesthetizing segment; a device for introducing air and ether into the respiratory tract; a means of varying the resistance of the exhaled air. It would seem that all of these requirements are not perfectly met by any single apparatus thus far devised, but they are present in sufficient degree to make the ingenious instruments of great practical value.

Sauerbruch's apparatus for negative pressure is an air tight cabinet in which the surgeon operates. The patient's head projects outside the cabinet and a tight fitting rubber collar is placed around his neck. Negative pressure is obtained by means of an electric suction air-pump. As the bronchioles are subjected to ordinary atmospheric pressure at the time that the thorax is exposed to negative pressure, collapse of the lung does not occur. It is interesting to note that an increased number of successful intrathoracic operations are being done in the clinics where this apparatus is in use.

Incision of the lung (pneumotomy) has been practised in cases of gangrenous cavities, abscesses caused by the extension of suppuration from other parts into the lung, abscesses connected with foreign bodies, bronchiectatic cavities, provided they are single (multiple ones can hardly receive much relief this way), and tubercular cavities, if there is only one, and the cough is very harassing. In one or two cases a similar operation has been practised for hydatid disease, and a few instances are recorded in which tumors have been removed from the lung. The localization of the disease and the treatment of the pleura are the chief difficulties. No incision may be made until the existence and accessibility of the cavity have been proved by puncture, and even then the greatest care is required, for the lung, unless it is consolidated by inflammation, is so yielding that a thick-walled sac can easily be pushed to one side. As a rule, cavities should not be approached from behind, for the large vessels run for the most part along the posterior surface of the bronchi. The size of a cavity cannot be estimated from the amount of fluid that is coughed up; according to Godlee, upward of a pint may come within 24 hours from a space that would not hold so much as 44 c.c. If a cavity is found, the lung tissue should be incised, and explored as far as possible with the finger, part of a rib being removed if necessary, and a large drainage-tube inserted. The shape is always very irregular, and it must be a long time before the sloughs have separated, and cicatrization can procure its obliteration.

The treatment of the pleura presents unusual difficulties. There can be no doubt that it is not advisable to incise a putrid cavity in the lung unless the pleural surfaces are adherent. If there is localized gangrene, and if it has already lasted for some time, the danger is not so great; adhesions are usually present under these conditions, and the lung is so consolidated by inflammation that it is in but slight danger of collapsing; but in acute cases and in bronchiectasis it is impossible to be certain. An attempt may be made to find out by ascertaining the mobility of the lung; if a needle is driven through an intercostal space into the pulmonary tissue, it will show to a certain extent by its movement whether the lung is fixed or not, but it is very easy to place too much reliance upon this. In some instances it may be possible to suture the two surfaces together and wait for a week, or to procure adhesions by means of the cautery applied to the intercostal muscles, but often it is impossible to wait so long, and even then the adhesions are so soft and delicate that the greatest care must be taken not to break them down (Moullin).

Excision of lung tissue (pneumonectomy) has been suggested to remove diseased portions. To remove the apex, the third or fourth rib is excised without opening the pleura until it is removed. The lung is then grasped and drawn into the pleural opening, which it plugs, and relieves the distress occasioned by allowing the air to enter. The portion of lung to be removed is ligated *en masse* and then cut away, the stump being seared with the cautery. The wound in the pleura is closed and sealed with collodion. The ligature must be firmly applied and asepsis must be rigid (Pyle). The results of the operation are not yet definitely determined.

LUPINOSIS (Lathyrism, Chick-pea Disease).—An affection due to prolonged use of meal made from the chick-pea (or vetches) which is mixed with barley and wheat. It is observed in India, France, Italy and Algiers. The symptoms are gastrointestinal derangement, pain accompanied by weakness and tremor followed by spastic paralysis of the legs with exaggerated reflexes. Treatment consists in removing the cause and relieving the symptoms.

LUPULIN.—The yellow, resinous powder of hops, composed mainly of dried glands from the strobiles of the plant; it is the *lupulinum* of the U. S. P. Its oleoresin is official. Dose, 5 to 15 grains. In nervous irritability lupulin may be used as a calmative and hypnotic. In irritable bladder, in alcoholism, and as an anaphrodisiac in chordee, gonorrhea, spermatorrhea, and other affections of the genitourinary organs, it is serviceable. See Hops.

In dysmenorrhea:

℞.	Lupulin,	ʒ j
	Confection of rose,	q. s.

Make into 20 pills. One pill 3 times a day.

LUPUS ERYTHEMATOSUS.—A cutaneous new growth characterized by well-defined reddish patches covered with yellowish or grayish adherent scales.

Symptoms.—The disease begins as one or more rounded or oval, pinhead-sized to pea-sized erythematous spots, which increase in size, either by peripheral extension or by coalescence of neighboring lesions. When fully developed, the disease appears as one or more sharply marginated, reddish or violaceous patches, varying in size from a small coin to the palm of the hand. The surface is covered by grayish or yellowish scales, firmly adherent to and dipping down into the patulous and distended openings of the sebaceous glands. The border of the patch is somewhat elevated, while the central portion is slightly depressed. Whitish atrophic scarring is usually present, and is characteristic of the disease. There is more or less infiltration and thickening. The subjective symptoms consist of moderate itching and burning.

The region most frequently affected is the face, particularly the cheeks and nose. The lips and, more rarely, the buccal mucous membrane may also be attacked.

The disease pursues a slow course, lasting months, and at times years. Occasionally involution of the patches occurs, with or without the persistence of scars.

Etiology.—The cause is obscure. Erythematous lupus is essentially a disease of adult life. It is more common in women than in men. Disorders of the sebaceous glands act as predisposing causes.

Diagnosis.—Lupus erythematosus may be distinguished from lupus vulgaris as follows:

LUPUS ERYTHEMATOSUS.	LUPUS VULGARIS.
1. Develops in adult life.	1. Develops in childhood or youth.
2. Disease is superficial.	2. Disease is deep-seated.
3. The lesions well-defined, scaly patches.	3. The lesions discrete papules and tubercles.
4. Sebaceous ducts patulous or distended.	4. Sebaceous system not involved.
5. Ulceration never occurs.	5. Ulceration with scarring nearly always present.

Prognosis.—Favorable as to ultimate cure, but guarded as to duration of disease.

Treatment.—But little reliance is to be placed upon internal treatment, although such drugs as iodin, arsenic, cod-liver oil, etc., are occasionally of value.

The local treatment consists of the use of sedative or stimulating applications, caustics, or surgical manipulation, according to the nature of the case.

Inasmuch as a certain number of cases recover spontaneously, with little or no scarring, the milder remedies should always be given a fair trial before proceeding to the use of caustics and the like.

Most cases do well under stimulating applications. An admirable method is vigorously to rub into the part, every day or every other day, sapo viridis or the tincture of green soap. This may be followed by a soothing ointment. Plasters are frequently of great value. Those most employed are the ordinary mercurial plaster and a 10 to 20 percent salicylic acid plaster.

When these remedies fail, and when the affection is severe and of long standing, one may cautiously resort to the use of such caustics as pure carbolic or trichloracetic acid, liquor potassæ, nitrate of silver, etc. Scarification and superficial curetting are often followed by good results. Sulphur, either in ointment (1 to 2 drams of precipitated sulphur to 1 ounce) or lotion, is a most efficient remedy.

A combination of sulphur and tar makes a useful formula:

℞.	Precipitated sulphur,	ʒ j
	Oil of cade,	ʒ j
	Zinc oxid ointment,	℥ j.

Apply twice a day.

Crocker speaks well of the use of collodion, either alone or with salicylic acid (10 to 30 grains to 1 ounce) incorporated in it.

Liquid air or, preferably, carbon dioxid snow has been used with excellent results.

LUPUS VULGARIS.—A tuberculous cellular new growth, characterized by reddish or brownish patches consisting of papules, nodules, and flat infiltrations, usually terminating in ulceration and scarring.

Symptoms.—The disease commonly begins as numerous pinpoint-sized to pinhead-sized, grouped or disseminated, reddish, yellowish, or brownish flat papules. They are softer than the surrounding skin, in which they appear to be embedded. Hutchinson has likened their appearance to "apple jelly."

These papules develop later into pea-sized or larger tubercles or nodules, which ultimately become aggregated in variously sized and shaped patches covered with imperfectly formed epidermis. After a variable duration the nodules coalesce, chiefly by individual extension, forming dull red, raised, soft patches.

The lupus nodules or patches may remain stationary for some time, but sooner or later undergo retrogressive change. The lesions may disappear by absorption, leaving a somewhat scarred, scaly, and atrophic skin (*lupus exfoliativus*), or, as is the more usual course, by ulceration, with resulting crusts and cicatrices (*lupus exedens, lupus exulcerans*). At times exuberant granulations spring up upon the borders of the ulcer (*lupus hypertrophicus*), or there may develop even papillomatous outgrowths (*lupus papillomatosus*).

The most frequent seat of lupus is upon the face, particularly the nose, cheeks, and ears. The trunk and extremities may also be involved. Besides the skin, lupus occasionally attacks the mucous membrane and cartilage of the nose, mouth, pharynx, larynx, or ears.

Subjective symptoms are, as a rule, wanting, although there may be slight pain.

The course of the disease is eminently chronic, the affection persisting for years, and frequently a lifetime.

Etiology.—The vast majority of cases begin before the age of 20, and many before the age of 10. The disease, however, is never congenital.

Lupus vulgaris is due to the invasion of the skin by the tubercle bacillus.

Pathology.—A section of lupus tissue shows, under the microscope, sharply circumscribed nests of cell-infiltration in the deeper layers of the corium. Epithelioid cells are present in varying numbers, and giant cells in abundance. Tubercle bacilli are few, and only discoverable by examination of many sections. When ulceration occurs, the centers of the nodules undergo coagulation necrosis and fatty degeneration.

Diagnosis.—The diseases most likely to be confounded with lupus vulgaris are the tubercular syphiloderm, lupus erythematosus, and epithelioma.

LUPUS VULGARIS.	TUBERCULAR SYPHILODERM.
1. Develops usually before the age of puberty.	1. Develops after the age of puberty.
2. Course slow.	2. Course rapid.
3. History, perhaps, of scrofulous hereditary tendency.	3. History of infection.
4. Concomitant signs of tuberculous diathesis.	4. Concomitant signs of syphilis.
5. Nodules soft.	5. Nodules hard.
6. Ulcers are comparatively superficial, with irregular, undermined edges; discharge slight; crusts scant and reddish-brown.	6. Ulcers are deep, with sharp-cut edges; discharge copious; crusts bulky and greenish.
7. Scars yellowish, shrunken, and hard.	7. Scars whitish, soft, and smooth.
8. Refractory to all but destructive measures.	8. Rapid healing under the iodids and mercury.

LUPUS VULGARIS.	EPITHELIOMA.
1. Develops usually before puberty.	1. Develops in middle and advanced life.
2. Course extremely slow.	2. Course more rapid.
3. Little or no pain.	3. Usually painful.
4. Ulcers multiple and superficial.	4. Ulcers single and deep.
5. Edges and base soft.	5. Edges and base hard; characteristic pearly border.

Prognosis.—The disease runs a decidedly chronic course. The prognosis depends upon the age of the patient and the form, extent, and duration of the disease. Occurring in small, circumscribed patches, the prognosis is favorable.

Treatment.—General hygienic measures, such as nutritious diet, fresh air, exercise, etc., should receive attention. In many cases the administration of such remedies as cod-liver oil, iodid of iron, etc., is indicated, although no direct curative influence is to be expected from their use. Thyroid extract and tuberculin have been used in some cases with encouraging results. Their curative value, however, is at the present time still conjectural.

Local treatment has for its object the extirpation of the lupus tissue with as little resultant scarring as possible. Before resorting to chemic caustics or surgical interference, it is well in some cases to employ milder measures. In hyperemic cases the condition is sometimes improved by the continued application of calamin lotion. Mercurial plaster occasionally exerts a beneficent influence on the disease. A salicylic acid (20 percent), creosote (40 percent), or resorcin plaster has been used with good results. Most cases, however, require more heroic treatment. The *solid stick of silver nitrate* is useful in the treatment of small discrete lesions. It is bored into the tissue until the nodule is destroyed. Every few days new lesions are attacked. *Pyrogallic acid* is a slow but practically painless caustic. It may be used in ointment or as a paint.

Brocq advises the following:

℞.	Pyrogallic acid, Salicylic acid,	each,	gr. 1
	Collodion,		℥ j.

Paint on the part every day until a slough is produced.

Arsenic trioxid is a rapid caustic, exerting a selective action upon diseased tissue. It is, however, very painful, and can only be used over small areas, on account of the danger of absorption.

℞.	Arsenic trioxid,	gr. xx
	Powdered acacia,	ʒ j
	Water,	q. s.

Spread on lint and apply for 24 hours. Then poultice until slough comes away.

Zinc chlorid is an efficient caustic, not so painful as arsenic. It does not, however, select diseased tissue.

℞.	Zinc chlorid,	℥ xvj
	Powdered opium,	℥ jss
	Hydrochloric acid,	ʒ vj
	Boiling water,	℥ xx.

(Middlesex Hospital formula.)

To 1 ounce of the solution add 2 drams of wheaten flour. Spread the paste upon lint and apply for 24 hours.

Curetting is an extremely valuable procedure. It is often supplemented by the use of a caustic or the application of the Paquelin cautery.

Scarification is a most useful measure, particularly in diffuse superficial patches. Numerous parallel incisions, crossed at right angles by others, are made through the skin by means of a sharp scalpel or scarifier. This is often advantageously followed by the application of an iodoform ointment or a bichlorid lotion.

The *galvanocautery* and the *Paquelin cautery* find a distinct field of usefulness in the treatment of certain forms of this disease.

Direct *exposure to sunlight* for 4 to 5 hours a day for months is reported to be effective. Remarkably good results have been attained by the use of the X-rays.

LYCETOL.—A tartrate of dimethyl diethylenediamin (dimethyl piperazin). It is said to be a reliable diuretic and uric acid solvent, free from untoward effects on the stomach, even though its use be long-continued. Dose, 15 to 30 grains daily in carbonated water or in lemonade.

LYCOPODIUM.—A very mobile, pale yellow, fine powder, consisting of the spores of the club-moss (*Lycopodium clavatum*) and of other species of Lycopodium. Lycopodium is odorless, tasteless, floats on water, which does not wet it, and burns quickly when thrown on a flame. It should be free from pine-pollen, starch, sand, and other impurities, which are detected by means of the microscope the lycopodium spores being about 1/800 of an inch in diameter, four-sided, and reticulated, with short projections on the edges. They contain about 47 percent of a bland, fixed oil. The plant was formerly considered to be diuretic and antispasmodic, and was used in rheumatism, epilepsy, and pulmonary and renal disorders. The powder is now employed quite extensively in pharmacy to facilitate the rolling of a pill-mass and to prevent adhesion of pills to each other. It makes an excellent absorbent and protective powder when dusted over an excoriated surface, as seen between the thighs of infants.

LYMPHADENOMA (Hodgkin's Disease; Lymphatic Anemia, Lymphadenosis Pseudoleukemia; Malignant Lymphoma.)—A form of anemia characterized by a hyperplasia of the lymphatic glands, usually a hypertrophic condition of the spleen, and without leukocytosis.

Etiology.—It generally occurs in people under 25 years of age, the majority of cases collected by Gowers being males. The exciting cause is not known. It has been attributed to constant irritation of the skin, to decayed teeth, to nasal catarrh—these conditions exciting a local glandular swelling which becomes general.

Pathology.—A hyperplasia of the lymph-glands is always present. A hypertrophic condition of the spleen is found in the majority of cases. The cervical lymph-glands are usually the first to enlarge, and soon involve the whole chain of glands. The axillary and inguinal glands are next affected. The marrow of the long bones is said to be converted into the soft lymphoid material. The liver is often enlarged, and is the seat of lymphoid tumors.

Symptoms and Course.—In the early stages the blood is either normal or there is a slight degree of anemia. Later there is a leukocytosis, the adult cells (polymorphonuclear leukocytes) alone being greatly increased. Myelocytes are occasionally found. With the advance of the destruction of red cells there is a corresponding diminution in the percentage of hemoglobin. The enlargement of the superficial glands of the neck usually marks the onset. They may be small and movable at first, but later involve the superstructures, and become hard and painful. They rarely suppurate. The liver and spleen are usually found enlarged. With the increase in the size of the lymph-glands there is a corresponding impoverishment of the blood. Dyspnea may be common. If there is enlargement of the abdominal lymphatics, pressure-symptoms arise, and there will be edema of the lower extremities. In the beginning there is slight fever, with a variation in the daily temperature, that in the evening being higher.

Diagnosis.—**Syphilis** may give rise to enlargement of the lymphatics, but the history will clear up the doubtful nature and an examination of the blood will confirm it.

Tuberculous glands usually occur in younger persons, and generally suppurate. In Hodgkin's disease suppuration is rare. In scrofulous (tuberculous) glands ordinarily only one chain of glands is involved, and usually these are the submaxillary, while in Hodgkin's disease the anterior and posterior cervical glands are generally first affected. The tuberculin test should be employed.

In tuberculous adenitis the liver and spleen are not enlarged to so great a degree as in pseudoleukemia. Lastly, as the disease advances, in pseudoleukemia there is a corresponding degree of anemia, as shown by the blood examination.

Leukocythemia is differentiated by its characteristic leukocytosis.

Carcinoma of lymphatic glands is generally secondary to cancer in another region. **Lymphosarcoma** tends to invade neighboring tissues. Diagnosis in malignant disease is confirmed by microscopic examination of a section of the tumor.

Prognosis.—Recovery is rare. Death usually occurs before the end of the third year of the disease.

Treatment.—If the glands are superficial, they should be excised, to prevent the disease spreading. Neighboring glands should also be removed. Late in the course an operation does no good. Of medicines, arsenic seems the most effective. Any of the prescriptions recommended under ANEMIA (*q. v.*) may be given. The injection of arsenic into the involved tissue is said to be especially valuable. Bone-marrow, sodium cacodylate or atoxyl may be used. With the use of medicine it will also be beneficial to surround the patient with the best possible hygienic conditions or recommend a change of climate. Phosphorus, in doses of 1/100 of a grain after meals, may also be given. Iodid of potassium in 10-grain doses, cod liver oil, iron, strychnin, inunctions of iodin (1 percent) are recommended. Improvement is reported as resulting from X-ray treatment. Local applications have never proved of much benefit.

LYMPHATICS, DISEASES. Lymphangitis, or inflammation of the lymphatic vessels, is generally associated with more or less inflammation of the lymphatic glands.

Etiology.—The most common cause is the absorption of septic or of infective products from a wound, which, however, is often very trivial, such as a simple scratch, abrasion, sting, or puncture; more rarely, the inflammation may follow upon mere irritation of the skin, as a chafe of the heel, excessive friction, or sunburn.

Pathology.—The walls of the lymphatics become infiltrated with cells, swollen, and softened, while the endothelium is shed and the lymph contained in the vessels often undergoes coagulation. The inflammation spreads to the surrounding tissues, but seldom higher in the course of the lymphatics than the first set of glands, which also become swollen and infiltrated and arrest the further absorption of the septic products. It may terminate in resolution, or in suppuration in and around the glands or, more rarely, around the lymphatics themselves. Sometimes the septic products appear to escape the glands, and general blood-poisoning ensues.

Symptoms.—In severe cases lymphangitis generally begins with a chill or rigor, followed by high temperature and fever, and perhaps vomiting and diarrhea. Red lines, when the superficial lymphatics are affected, are seen running from the wound to the nearest lymphatic glands, with here and there erysipelatous patches of redness. There are generally pain and tenderness, especially in the region of the swollen glands, and swelling and edema, sometimes of the whole limb. It may be differentiated from phlebitis by the redness being superficial and in the course of the lymphatics, not in the course of the veins, by the absence of the cord-like and knotty feel of plugged veins, and by the presence of glandular enlargement; from erysipelas by the redness having no defined margin, and generally running in lines.

The treatment consists in attending to any wound or abrasion, allaying other sources of irritation that may be present, and placing the inflamed part at rest in an elevated position. Hot fomentations of poultices, or glycerin and belladonna, may be applied, and abscesses should be opened as soon as they form. If any swelling is left, pressure, or ammoniac and mercury plaster, may be used to disperse it.

Lymphatic varix, or **lymphangiectasis,** is very rare. It is attended by a condition of elephantiasis of the parts where the lymphatics are blocked. When the superficial vessels are affected, "the varix first appears in the form of small elevations, giving the skin an appearance which has been compared to the rind of an orange. It subsequently takes the form of little vesicles, covered with a thin layer of dermis" (Erichsen). At times the dilated lymphatics form distinct tumors (*lymphangiomata*).

Treatment.—Slight elastic pressure and protection from injury or irritation.

Lymphatic fistula, or **lymphorrhea,** though exceedingly rare, is a condition sometimes met, and more especially in the groin, scrotum, or labium. It is said to be due to a wound of a lymphatic or to the giving way of a varicose lymphatic, but the cause is not clearly understood.

Lymphadenitis, or inflammation of the lymphatic glands, may be acute, subacute, or chronic.

Acute or subacute inflammation of lymphatic glands is nearly always secondary to inflammation of the parts from which the afferent lymphatics proceed. Indeed, in most inflammations there is some tenderness of the neighboring glands. The lymphatic vessels themselves often escape, although the glands may become extensively involved, and even suppurate. The inflammation, however, rarely proceeds further in the course of the lymphatics than the first series of lymphatic glands, although it often spreads to the surrounding tissues (*perilymphadenitis*). The changes in the inflamed gland are like those of other inflammations. The whole gland is enlarged, the vessels dilated, and the lymph sinuses crowded with cells. Microorganisms similar to those found in the inflammatory lesion, giving rise to the lymphadenitis, have been discovered in the glands.

The symptoms are tenderness, heat, pain, and swelling, followed by redness of the skin and edema. The gland, at first movable, becomes fixed, and if the process runs on to suppuration, the usual signs of an abscess ensue. Familiar examples of lymphadenitis are seen in the **bubo** of gonorrhea, in the tender glands of erysipelas, and in the suppurating bubo of soft chancre. In from 2 to 3 weeks after the appearance of the chancroid, in the proportion of about 1 case in 4, a single lymphatic gland in the groin becomes swollen, painful, and tender; the overlying skin becomes red, edematous, hot, swollen, and inflamed; a soft spot appears upon the swelling, and after a little while there is decided fluctuation and an abscess is formed in the gland.

The treatment consists in subduing the inflammation of the part from which the lymphatics proceed, painting the glands with glycerin and belladonna, applying a hot poultice, and, if suppuration has occurred, in making a free incision. Some surgeons dissect out the glands if suppuration threatens. As soon as a bubo begins to swell and becomes tender, it is advised to charge a syringe with the 1 : 500 solution of corrosive sublimate or with a 3 percent solution of carbolic acid and to inject a few drops into the gland, repeating this in different portions of the diseased structure until 15 or 20 drops of the solution have been introduced. If this does not arrest the formation of pus, it will be necessary to wait, and when the pus is formed lay the abscess freely open.

Chronic lymphadenitis is very common in strumous children, especially in the neck. The affection of the glands can frequently be traced to some exciting cause, as the irritation of pediculi on the head, eczematous affections about the mouth, enlarged tonsils, or carious teeth. It also occurs as a result of chronic affection, especially of tuberculosis and syphilis. The glands slowly enlarge and become infiltrated with small roundcells; while in the tubercular cases nonvascular areas containing giant cells, lymphoid corpuscles, and tubercle bacilli are found. The enlargement may subside, or the inflammatory products may caseate, and suppuration occur in or in and around the gland; at times the caseous mass may dry up and become cretaceous, or atrophy or fibroid thickening may ensue. In rare instances, it is said, the tubercle may become disseminated, leading to general tuberculosis.

Symptoms.—The glands, when those of the neck (the most common situation) are affected, enlarge on one or both sides of the neck, but without pain. They are at first distinct and movable, but later often coalesce and become adherent to the surrounding parts. After a time they may soften and break down; the skin then becomes adherent and red, gives way, and a curdy pus is exuded. After the abscess has been opened, a portion of the broken-down gland may be seen in the floor of the ulcer, the edges of which are bluish-pink and undermined. The ulcers are very indolent, and, when finally healed, leave characteristic raised, puckered, pinkish-white scars. Concomitant signs of struma or tubercle are frequently present.

Treatment.—Any source of irritation, such as pediculi, carious teeth, etc., should be sought and removed; and if the patient is syphilitic or tuberculous, specific treatment is indicated. If suppuration threatens, the glands should be removed. If an abscess has already formed, it should be opened early to prevent scarring. This may be done by a small incision, after which the capsule of the gland may be cleared out by a Volkmann's spoon. Should an indolent ulcer or sinus remain, as often happens if the abscess is allowed to burst spontaneously, it should also be scraped with a Volkmann's spoon and its edges destroyed by silver nitrate or potassium hydroxid or, better, excised. With good drainage established, Bier's suction glasses may be efficient. In some cases injection of iodoform emulsion or iodoform packing may be advantageous. If streptococci or staphylococci are found in the pus, autogenous vaccines may be of decided value.

Treatment of Tuberculous Glands.—The X-rays have been used with success. Bier's constriction hyperemia may be markedly beneficial. (The elastic bandage may be used at first, then if an abscess forms, after incising and evacuating, suction should be applied.) Tuberculin injections, the results of which seem very encouraging, should be tried. (See TUBERCULOSIS.) If no improvement results in three months the bovine strain should be used. In adults and those with a family history of the disease the human bacillus is generally the cause, but in children the bovine type is usually found, due to milk infection. According to Ritchie, to the bovine type is generally due glandular, skin, and eye tuberculosis; to the human, bone and lung varieties. Another valuable remedy is guaiacol in the form of inunctions.

LYMPHATISM.—See STATUS LYMPHATICUS.

LYSIDIN (Methylglyoxalidin).—Lysidin is prepared by the interaction of sodium acetate and ethylendiamin hydrochlorid. It is a bright-red crystalline mass, very hygroscopic, and characterized by a peculiar mouse-like odor. It is sold in a 50 percent solution. Lysidin is recommended as a solvent for uric acid deposits, being given in doses of 1/2 to 2 1/2 drams of the 50 percent alkaline solution dissolved in an excess of carbonated water. It is claimed that lysidin possesses five times the power of piperazin.

LYSOL.—An antiseptic and disinfectant saponified product of coal-tar, chiefly composed of cresols, occurring as a clear brown, oily liquid, readily miscible with water, and forming clear solutions with glycerin, alcohol, chloroform, and various other fluids. It is generally employed in a 1 percent solution, and only as a local application. It is said to be superior to carbolic acid, creolin, and other analogous coal-tar products as a germicide, but it has no advantage over other antiseptics of established reputation, and is only efficient in solutions of sufficient strength to be irritating or caustic. It is useful to arrest epidemics or in prophylaxis, and is particularly serviceable in disinfection of privies, premises, ships, and stables, being readily soluble, active, and cheap. A solution of 1 : 1000 is said to destroy streptococci in 15 minutes.

LYSSA.—See HYDROPHOBIA.

M

MACROGLOSSIA.—Hypertrophic development of the tongue, a condition seen in cretins, in whom it is probably due to lymphangioma. See TONGUE.

MADURA FOOT.—See MYCETOMA.

MAGNESIUM.—Mg; atomic weight 24.3; quantivalence II; specific gravity 1.75. One of the metals of the alkaline earths, widely distributed in inorganic nature and forming also a constituent of animal and vegetable tissues. The physiologic effects of its salts are antacid and laxative.

Therapeutics.—Magnesia and magnesium carbonate are used as antacids and laxatives, in acidity, sick headache, flatulent colic, etc., and as antidotes in poisoning by acids, arsenic, phosphorus, and mercuric and cupric salts. The citrate is an agreeable laxative, cooling and acceptable to the stomach. The sulphate (Epsom salt) is one of the most efficient of the saline cathartics, and has a wide field of application. In acute inflammatory conditions, renal and cardiac dropsy, ascites from obstruction of the portal circulation, increased blood-pressure within the cranium, intestinal obstruction without acute inflammation, the constipation of lead-poisoning, and habitual constipation from deficiency of the intestinal secretions, this agent will be found to be exceedingly serviceable. Acute dysentery is well treated by magnesium sulphate combined with diluted sulphuric acid, and followed by opium and starch enemata. Bleeding from hemorrhoids and uterine hemorrhage are often relieved by the same combination when other agents fail. In acne vulgaris and other obstinate eruptions due to derangement of the stomach and intestinal canal good results are often obtained by a purgative dose of the sulphate daily before breakfast or by doses of 5 grains in water 3 or 4 times a day. The same salt, finely triturated, makes an excellent dusting-powder for cases of acne rosacea. The ferrosaline mixture is a very useful laxative in the constipation of anemic women. The bitter taste of Epsom salt is best covered by coffee. A saturated solution of magnesium sulphate, continuously applied, has beneficial influence on local inflammation, especially erysipelas and orchitis.

A uric acid solvent:

℞.	Magnesium carbonate,	ʒ j
	Citric acid, Sodium biborate, } each,	ʒ ij
	Boiling water,	℥ viij.

A tablespoonful 3 or 4 times daily.

In heartburn:

℞.	Calcined magnesia,	ʒ ss
	Peppermint-water,	℥ jss
	Tincture of orange,	ʒ j.

Give at a draft.

In dyspepsia with acidity:

℞.	Magnesium carbonate,	gr. xx
	Compound infusion of gentian,	ʒ xj
	Compound tincture of cardamom,	ʒ j.

Give at a draft, twice daily.

In obstinate constipation:

℞.	Magnesium sulphate,	℥ ij
	Glycerin,	ʒ j
	Water,	℥ iv.

Use as a rectal injection.

Incompatible with *magnesium oxid* are: Acids, copaiba (forms a solid mass), water (in small quantity hydrates it). With *magnesium salts* are: Alkalies, arsenates, carbonates, lead acetate, lime-water, oxalates, phosphates, silver nitrate, sulphites, tartrates.

Preparations.—**M. Carbonas**—light, friable masses, or powder, odorless and tasteless, insoluble in alcohol, almost insoluble in water. Dose, 10 to 60 grains. **M. Oxidum,** *magnesium oxid, magnesia*—is made by heating the light carbonate in a crucible to expel nearly all the carbonic acid. A white, light and very fine powder, almost insoluble in water, insoluble in alcohol, and gelatinizes with 15 of water after standing 1/2 hour, having become hydrated. It is a constituent of pulvis rhei compostitus, and ferri hydroxidum cum magnesii oxido. Dose, 10 to 45 grains. **M. Oxidum Ponderosum,** *heavy magnesium oxid, heavy magnesia*—is a white, dense and very fine powder, corresponding in other properties and reactions to magnesia, except that it does not gelatinize with water. It is made by calcining the heavier carbonate, and is much slower in action than the light magnesia. Dose, 10 to 45 grains. **M. Sulphas** (*Epsom salt*)—colorless prisms or acicular needles, slowly efflorescent, odorless, of cooling, saline taste, and neutral reaction, very soluble in water, insoluble in alcohol. Is a constituent of infusum sennæ compositum. Dose, 1 to 8 drams in plenty of water. **M. Sulphas Effervescens**—is prepared from the sulphate 50, sodium bicarbonate 40.3, tartaric acid 21.1, citric acid 13.6. A coarsely granular, white, deliquescent salt, of acid taste and reaction, soluble in water, insoluble in alcohol. Dose, 1 to 8 drams. **Liquor M. Citratis**—prepared from the carbonate 15, citric acid 33, syrup of citric acid 60, potassium bicarbonate 2 1/2, water to 360. Dose, 6 to 20 ounces, for catharsis.

MAGNET.—Strictly speaking, a magnet is a body having the power to attract the unlike pole of another magnet, or to repel the like pole, and also to attract easily magnetizable bodies. Lodestone, an oxid of iron, is a natural magnet. The electromagnet is a piece of soft iron temporarily magnetized by induction or by insertion into a helix. The electromagnet is used for locating and extracting foreign bodies, especially from the eye. See EYEBALL (Injuries).

MALACOSTEON.—See BONE (Diseases).

MALARIAL FEVERS (Malaria). Synonyms.—Chills and fever; ague; fever and ague; swamp fever; intermittent fever; remittent fever; paludism; miasmatic fever.

Definition.—A specific infectious disease depending upon the presence in the blood of a protozoan parasite, the hematozoon or plasmodium malariæ of Laveran, which develops within, and at the expense of, the red blood-corpuscles of the infected individual, resulting, according to the species and number of the parasites present, in more or less periodic febrile paroxysms or in continued fever.

Distribution of the Disease; Climatic and Telluric Conditions under Which Malaria Prevails; Manner of Infection.—Malarial fever is especially prevalent in moist tropical districts, but occurs in almost all parts of the world, being absent only from the coldest regions. The most pernicious forms are seen in tropical Africa, India, South America, the East and West Indies; here the disease prevails throughout the year. In temperate countries malaria is most prevalent during the later summer and early fall. Moisture favors the development of the disease, which is particularly frequent in lowlands bordering upon rivers, lakes, and marshes; it is rare in mountainous districts. Drainage and cultivation prevent the disease, while extensive turning up of soil often gives rise to an outbreak. In malarious regions unaccountable cycles of variation in severity and frequency of the disease often occur. Mosquitos prevail in all regions and under all conditions favorable to malaria. The dark-skinned races are much less susceptible to the disease than are the whites.

The Manner of Infection.—The only mode of infection is through the bites of mosquitos belonging to the genus anopheles. The experiments and observations of Manson, Ross, Grassi, Bignami, and Bastianelli have shown that certain varieties of mosquitos are normal intermediate hosts of the hemameba malariae, which undergoes a sexual cycle of existence, lasting about 10 days, in the walls of that insect's intestine. At the end of the period large numbers of sporozoids become stored in the cells of the salivary gland, from which they are introduced into the human body with the bites. In its human host the parasite reproduces itself asexually by sporulation. It breaks up into sporocytes each of which penetrates a red blood cell in which it grows and upon which it feeds. When mature it breaks into spores. Some of the sporocytes, however, are sexual cells, gametocytes, and do not break up into spores. If they gain entrance into the mosquito they reproduce themselves sexually. See MOSQUITOS.

The period of incubation lasts apparently from several days to several weeks.

The Infectious Agents.—The hemamebæ malariæ were discovered in 1880 by Laveran. They have since been shown to belong to the class of sporozoa, order of Hemosporidia. Three distinct species of the parasite have been differentiated: (1) The tertian parasite; (2) the quartan parasite; (3) the estivoautumnal parasite.

The first two parasites are associated with more or less regularly intermittent fevers; the last variety with fevers which may be regularly intermittent, but are more often irregular or continued.

1. **The Quartan Parasite.**—This organism exists in the blood in great groups, all the members of which are approximately at the same stage of development and pass through their cycle nearly in unison. The cycle lasts almost exactly 72 hours, at the end of which time the parasites which have reached maturity undergo sporulation, the fresh spores attacking new corpuscles. Sporulation of a group of parasites, if it has reached a sufficient size, is always associated with a paroxysm in the infected individual. The immediate cause of the malarial paroxysm is thought to be the liberation of some toxic substance, probably by the parasites at the time of sporulation.

Not infrequently 2 or 3 groups of parasites are present. When this is the case, they almost always reach maturity on different days, resulting in paroxysms on 2 successive days, with a day of intermission between, or in daily paroxysms. Very rarely the presence of multiple groups causes irregular or continued fever. In a triple quartan infection the disease assumes a daily or quotidian type.

In its youngest form the quartan parasite is represented by a minute, colorless disc, about 1 mm. in diameter, lying within the red corpuscle. This shows more or less active ameboid movements. As it increases in size the activity of the ameboid movements diminishes, and fine, dark pigment granules begin to develop. These show a lazy motion in the younger forms, but are almost motionless in the adult bodies. The pigment granules lie about the periphery of the parasite, the outlines of which are usually quite distinct. The red corpuscle tends to retract about the growing organism, and sometimes assumes a somewhat deeper, slightly brassy color. At the end of about 3 days the parasites reach a size about two-thirds that of the normal red corpuscle, while the rim of the retracted corpuscle becomes almost imperceptible. At this stage the pigment begins to collect toward a single point, usually at the center of the parasite, flowing in radial lines. The organism then breaks up into from 6 to 12 radially arranged leaflets, surrounding the central pigment like a roset. Finally, the surrounding shell of red blood-corpuscle ruptures and the separate segments spring apart, appearing as small, round, colorless bodies. These represent complete young parasites, and immediately attack new red blood-corpuscles, to pursue again their cycle of existence.

Not all adult bodies undergo segmentation. Some become vacuolated and fragmented, a process indicative probably of degeneration. From other full-grown bodies there are developed, at times, actively motile filaments (flagella), which will be spoken of later.

2. **The Tertian Parasite.**—The tertian parasite, like the quartan, exists in the blood in great groups. Its life cycle, however, lasts but 48 hours, so that sporulation occurs every other day. Infections with 2 groups of organisms segmenting on successive days are common, the disease assuming a quotidian or daily type. Infections with multiple groups, causing irregular or continued fever, occur, but are rather uncommon.

The tertian parasite shows certain morphologic differences from the quartan organism. In the early stages the parasites are more actively ameboid; the pigment granules are smaller, more motile, and show less tendency to accumulate about the periphery of the body. The parasite is paler and less refractile, and at maturity reaches a larger size. The surrounding corpuscle expands with the growth of the parasite and becomes progressively decolorized. At segmentation the pigment does not flow in toward the center in such characteristic radial lines as in the quartan organism, while the number of segments is materially larger, ranging usually from 12 to 20 or even 30.

3. **The Estivoautumnal Parasite.**—This variety is responsible for the more serious, more chronic, malignant or pernicious forms of malaria. The estivoautumnal parasite differs from the tertian in that the regular arrangement in groups is less frequent. When this is the case at the beginning of an attack, multiple groups, as a rule, rapidly appear, resulting often in the development of irregular or continued fever. The parasite of estivoautumnal fever is smaller than the tertian or quartan organisms, and, as a rule, only the earlier stages are to be found in the peripheral circulation. The later stages and segmenting forms are to be found only in internal organs, especially the bone-marrow, spleen, or, in some pernicious cases, in the brain or intestine. The earliest stages are represented by very minute, colorless bodies, which often are sharply refractive, and frequently assume a ring-like appearance. Commonly, these ring-like forms show rapid transitions into disc-like or actively ameboid bodies. The amount of pigment contained is relatively slight, the earliest granules being so minute as to be almost imperceptible. At full development the parasites may be no more than half the size of a red corpuscle. Segmentation occurs in the same manner as in the tertian parasite.

A certain number of full-grown forms do not, however, segment, but accumulate larger, coarser, pigment granules, and develop gradually into an ovoid or crescentic shape, about which the rim of the red corpuscle may, with difficulty, be distinguished. Usually only a bit of red corpuscle is visible, hanging from the concave side of the crescent. At times these bodies may be seen to change into round forms with a central clump or ring of pigment.

The Flagellate Forms (**Gametocytes**).—In all three forms of parasites delicate motile filaments may develop from certain full-grown forms. In the estivoautumnal organism these come only from the round bodies derived from crescents. Their appearance is preceded by extremely active dancing movements of the pigment granules, after which suddenly from 1 to 4 of such filaments, 2 or 3 times the length of the diameter of a red cell, break out from the periphery. These are at first attached to the mother body, but often break loose and swim about with active serpentine motion. In several instances these bodies have been observed to penetrate other full-grown parasites. The significance of flagellate bodies has long been a question of dispute. The remarkable observations of McCallum, however, make it extremely probable that they are sexual elements, the penetration representing a process of fecundation. It is apparently only these fecundated bodies which are capable of undergoing further development within the stomach-wall of the mosquito.

Symptoms.—The symptoms of malarial fever differ according to the species of parasite with which the individual is infected.

Quartan Fever.—In infections with a single group of the quartan parasite the symptoms consist of regularly intermittent paroxysms occurring every fourth day at nearly the same hour. The paroxysm consists of 3 stages: (1) Chill; (2) fever; (3) sweating. The entire duration of the fever, which begins often before or during the chill, amounts to as much as 10 to 12 hours in severe cases. The chill varies greatly in intensity, and may be entirely absent, though chilly sensations are present in over 95 percent of the cases. This is followed by a sensation of extreme heat, which may last from but a short time to several hours. Both stages are often associated with severe headache, pains in the back and extremities, nausea, vomiting, and sometimes diarrhea. The febrile stage is usually succeeded by profuse sweating, the temperature rapidly falling, generally to a subnormal point, the patient experiencing great relief from all his symptoms. Between paroxysms the temperature is usually subnormal.

Infections with 2 or 3 groups of parasites following on different days, resulting in paroxysms occurring on 2 successive days, with a day of intermission between, or in daily paroxysms are common. Occasionally irregular or continued fever, as a result of infection with multiple groups of parasites, may be present.

Tertian Fever.—The paroxysms here occur every other day. Infections with 2 groups of tertian parasites are very common, resulting in daily paroxysms. Multiple infections with irregular fever are rare.

Tertian and quartan fever are the commonest types in temperate climates, and in the more severely malarious regions prevail during the healthy season.

Estivoautumnal Fever.—Estivoautumnal fever is the prevailing type in the severely malarial districts of the tropics, and occurs in temperate regions only at the height of the malarial season. The manifestations differ from those of tertian and quartan fever, (1) in that the paroxysms are, as a rule, much more irregular; (2) they are much longer in duration; (3) the chills are more frequently absent; (4) the fever is often irregularly intermittent, remittent, or continuous in character, owing probably to the presence of multiple groups of parasites.

When the fever is regularly intermittent, the paroxysms occur usually about 48 hours apart; the intervals, however, may be as short as 24 hours, and in other instances longer even than 48. As a general rule, the longer the interval, the longer is the paroxysm, which may, in some instances, last more than 36 hours. When the fever is irregular and continuous and chills are absent, the clinical picture may closely resemble that of typhoid fever.

The spleen is enlarged in all forms of malaria, and in the majority of instances it is palpable. Herpes on the lips is common. Urticarial eruptions are occasionally seen.

Pernicious Fevers.—With severe estivoautumnal infections the malarial paroxysms may assume an extremely malignant, and often rapidly fatal, form. These intense infections are often referred to as "pernicious." There are several well-recognized types of pernicious fever.

The *comatose* type is the commonest. With the onset of the paroxysm the patient becomes profoundly unconscious. Local paralyses or irritative symptoms may be present.

In other instances the pernicious paroxysm may assume an *algid*, *choleriform*, *hemorrhagic*, *sudorific*, *bilious*, *gastralgic*, or *pneumonic* type. The picture in choleriform malaria may be similar to that in Asiatic cholera.

Malarial Hemoglobinuria.—The malarial paroxysm may be accompanied by hemoglobinuria. These instances are unusual, excepting in certain very malarious tropical districts. This extremely grave condition of paroxysmal hemoglobinuria is also known as **black-water fever.** The symptom usually arises in individuals who have had repeated attacks of malaria; rarely or never does it occur with the first manifestations of the disease.

Sometimes, if the first attack is not fatal, several successive paroxysms may be accompanied by hemoglobinuria. More commonly, however, the recovery from a hemoglobinuric paroxysm is followed by at least a temporary disappearance of the symptoms of malaria. This is probably due to the fact that with the extensive blood destruction the parasitiferous corpuscles are almost all destroyed, and the parasites, being set free, are killed. Often the hemoglobinuric attack is postmalarial. In all instances the onset occurs with an intense chill, rapidly followed by the passage of deep red and then almost black urine. If death does not occur during the immediate paroxysm, it may follow shortly afterward from complete suppression of the urine. or, after several weeks, from a severe acute nephritis. See BLACK-WATER FEVER.

Malarial Paroxysms with Long Intervals.—Cases of malaria may occur in which the paroxysms occur at long intervals—5 or 6 days to several weeks. These symptoms, which may occur with all 3 types of infection, are due to the fact that so many parasites are destroyed at the time of sporulation that practically a new incubation period must be passed through before the number is sufficient to cause symptoms again.

Sequels and Complications.—**Relapses** are frequent in ill-treated malaria. They may occur after long periods—months, and even years. There is no essential difference between the symptoms of the relapse and the initial attack.

Anemia.—Owing to the destruction of red blood-corpuscles, resulting from the growth of the parasite, anemia is a common sequel. In some instances it may assume a pernicious type.

Chronic Malarial Cachexia.—In patients with ill-treated or frequently recurring infections, a condition of grave cachexia sometimes develops. There are marked anemia, enlargement of the spleen and of the liver, and a tendency toward dropsical effusions.

Nephritis.—Acute nephritis may accompany or follow an attack of malarial fever, as of any other severe acute infection. The course is usually mild, though sometimes grave chronic changes may follow.

Amyloid degeneration has been noted after long-continued and frequently recurring malaria.

There is some evidence that **cirrhosis of the liver** may follow malaria. Its frequency, however, is probably much exaggerated.

Peripheral neuritis may occasionally occur.

Complications.—**Mixed Infections.**—Pneumonia, typhoid fever, tuberculosis, or any acute infectious disease may complicate malaria. An individual with malarial cachexia is probably more susceptible to most acute infections than a healthy subject. There is nothing especially characteristic about the course of these cases.

Pneumonia, as a complication of malaria, pursues its usual course.

In individuals with combined **typhoid** and malarial infections the malaria usually remains quiescent during the course of the typhiod fever, reappearing again with or after defervescence. Sometimes, however, active symptoms of the two diseases may be present at the same time. These instances are, however, unusual. *There is nothing to show that the course of typhoid fever in malarious districts differs in any essential way from that in other parts of the world.*

Pathologic Anatomy.—In individuals dead from acute malaria there is more or less marked pigmentation of all the organs. The **spleen** is always greatly enlarged and soft. The other changes depend upon the especial localization of the parasites, which varies in different cases. When the **brain** is especially affected, the capillaries are crowded with parasites, actual thromboses sometimes occurring. There may be numerous punctate hemorrhages. Finer degenerative changes in the neurons themselves have been described by Monti. In other instances the organisms seek especially the mucous membrane of the **stomach** and **intestines,** resulting in great injection of the mucosa with hemorrhage and superficial ulceration. The **liver** is enlarged, shows great numbers of parasites and macrophages in its capillaries, and often areas of focal necrosis not dissimilar to those seen in other acute intoxications. Similar areas are to be found in the **spleen** and the **bone-marrow,** where great accumulations of parasites and pigment are also to be found.

In chronic cases the spleen is enormously enlarged and shows extensive fibrous changes. Similar changes are sometimes to be found in the liver and bone-marrow.

Diagnosis.—In most instances the diagnosis of malaria is simple, and based upon the nature of the paroxysms—chill, fever, sweating—and their characteristic periodicity.

Chills and fever, however, do not of necessity mean malaria and a positive diagnosis is only to be made by an examination of the blood and the discovery of the parasites. Examination of the blood is, perhaps, best made with the fresh specimen though the examination of dried and stained blood films, prepared according to the ordinary methods, is also satisfactory.

The disappearance of the symptoms under treatment with quinin is strong confirmatory evidence that the process is malarial.

In instances of continued or remittent fever the process may so far simulate typhoid that the distinction is impossible without an examination of the blood or the therapeutic test.

Prognosis.—In temperate climates the prognosis is almost always good. This is always true with tertian and quartan fever. In estivoautumnal fever there is always a certain danger that pernicious symptoms may appear.

Pernicious Malaria.—The prognosis, when pernicious manifestations appear, is always very grave. In the comatose cases death may occur a week or more after the beginning of treatment, when the blood is entirely free from parasites, a result, apparently, of the grave anatomic and chemic changes produced by the acute infection.

Hemoglobinuria.—The prognosis in hemoglobinuria, occurring with or after malaria, is always grave.

Prophylaxis.—Since extermination of the mosquitos belonging to the genus anopheles means the wiping out of the disease, attempts should be made to destroy the larvæ by disinfection (with kerosene) and drainage of the breeding places, and by removal of stagnant water. See DISINFECTION.

Mosquitos should be excluded from houses by wire netting. Careful screening of the malarial patient is important, in order to prevent infection of mosquitos. Exposure after nightfall should be avoided since the mosquito is chiefly nocturnal in its biting habits. Quinin has been proved to be of decided value as a prophylactic and 5 to 10 grains should be taken daily by new arrivals in malarial districts and also at intervals by the residents. Arsenic and iron are advocated by some observers as prophylactics; their value, however, probably lies in their increasing the quality and quantity of red blood-corpuscles.

Treatment.—In every case of acute malaria the patient should, if possible, be compelled to give up his occupation for at least 2 days. He should have physical and mental rest. If there is constipation, a purgative should be given. Medicinally, the treatment is simple and absolutely satisfactory, consisting in the administration of quinin. This is best given in solution. A favorite prescription is as follows:

℞.	Quinin sulphate,	ʒ j
	Dilute hydrochloric acid,	ʒ j
	Simple elixir,	ʒ iij
	Water, enough to make	℥ iij.

Two teaspoonfuls every 4 hours.

With an adult it is well, perhaps, to give 5 grains of quinin 3 or 4 times a day for the first several days, and, later, 2 grains 3 or 4 times a day.

In patients who are readily cinchonized and are unable to take large doses, complete cure may be obtained by doses as small as 2 grains 3 times a day, if the patient is kept at rest in bed. If the patient is seen during, or immediately after, a paroxysm, a single large dose—10 grains—will often prevent the next paroxysm which would come from that group of parasites.

In estivoautumnal fevers it is always important to keep the patient in bed for several days if possible. In ordinary cases in temperate climates quinin, 5 grains every 4 hours, and continued for a week, and followed by a reduction in the dose to 2 or 3 grains for several weeks afterward is usually quite sufficient. In all these instances treatment should be continued for at least 3 weeks.

If the symptoms are severe, and it is desirable to obtain a more immediate effect, larger doses may be given immediately before or during the paroxysm, at which time the action of the drug upon the parasites is most effectual.

In pernicious paroxysms larger doses of quinin must be administered hypodermically or intravenously. For this the dihydrochlorid or the hydrochlorid of quinin and urea is probably the best form in which to administer the drug. If given hypodermically, the injection must be made deeply in order to avoid abscesses which are otherwise frequent. Intravenous injections, which are especially effectual and are to be recommended in pernicious cases, may be given into the median basilic vein.

The following formulas may be suggested for hypodermic or intravenous use:

℞.	Quinin and urea hydrochlorid,	gr. x to xv
	Distilled water,	ʒ j.

Or,

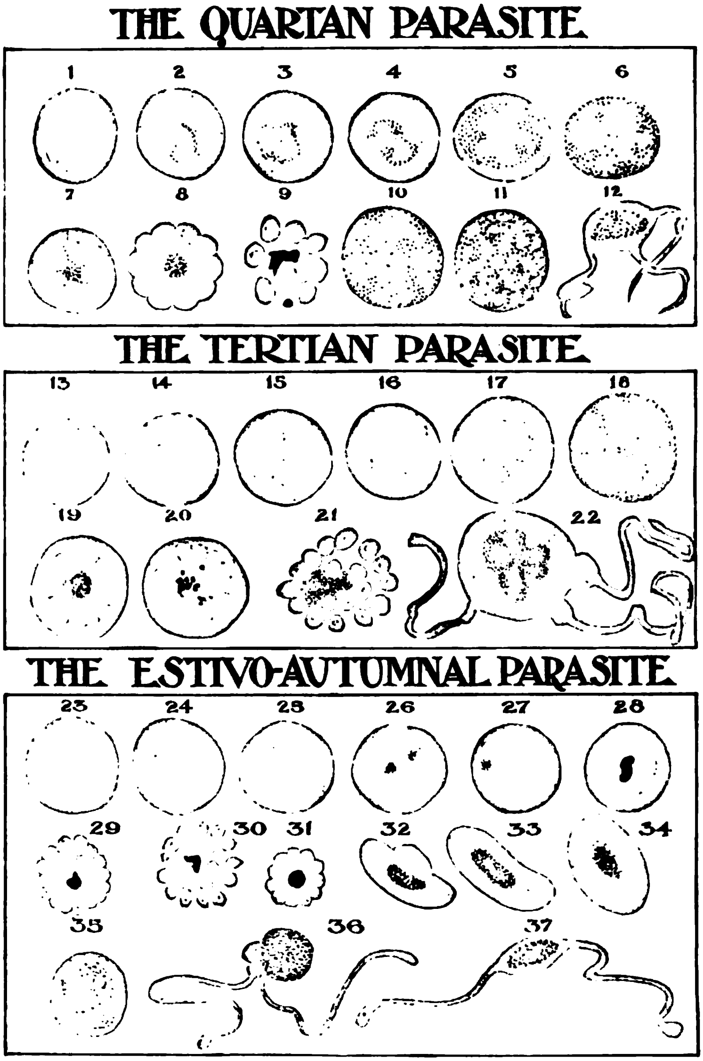
℞.	Dihydrochlorid of quinin,	gr. xv
	Sodium chlorid,	gr. j
	Distilled water,	ʒ ijss.

This may be injected, 5 c.c. (75 minims) at a time, into the median basilic vein.

The dihydrochlorid of quinin is soluble in less than its own quantity of water, and may be given hypodermically in a more concentrated form than in the case of other quinin salts.

It is rarely necessary or wise to give more than

PLATE I.



DESCRIPTION.

Quartan 1, 2, 3, 4, 5, and 6, show the development from the hyaline form to the mature intracellular (6) and large extracellular (10) forms; 11 shows vacuolization of an extracellular form; 7, 8, 9, show segmentation stages; 12, the flagellate form.

NOTE.—In the tertian and estivo-autumnal organisms the same phases are shown.

NOTE.—

A. Relative depth of color in the erythrocyte host, deepest in the quartan, lightest in the tertian.

B. Comparatively coarse, scant, and dark granules of the quartan as compared with the tertian.

C. Tendency to shrinkage in the erythrocyte host of quartan *vs.* large pale host of tertian.

D. Peripheral arrangement of pigment in development stage of tertian and quartan followed by central grouping initiating segmentation.

E. Greater regularity in quartan as compared with tertian forms.

F. Relative number of segments.

G. Greater density and clearer outline of quartan forms.

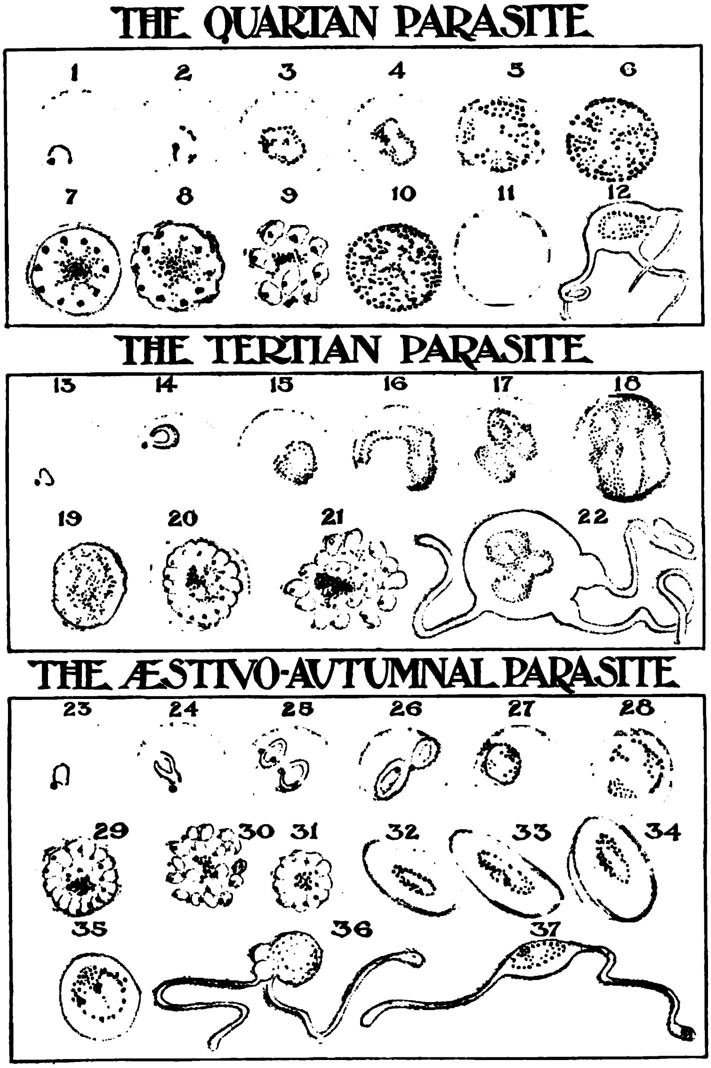
H. Star-like arrangement of pigment in early segmentation stage of quartan.

I. Relatively small flagellate forms of quartan and estivo-autumnal.

J. The peculiar ovals and crescents of the developed estivo-autumnal form, its scantily pigmented spherical form (35) and the ring bodies of the early stage.

—(*Greene's Medical Diagnosis.*)

PLATE II.



DESCRIPTION.

Malarial organism of types shown in plate but treated with Wright's stain.

Quartan Parasite.

1. Non-pigmented form.

2, 3, 4. Young organisms showing chromatin bodies (red) and pigment granules.

5, 6. Full-grown parasites, the former intracellular, the latter extracellular.

7, 8. Presegmentation forms.

9. Segmentation.

11. Normal blood cell.

12. Flagellate body.

Tertian Parasite. The forms are self-explanatory in connection with the preceding description.

Estivo-autumnal Form. Various ring forms are shown together with the characteristic crescents, Nos. 32, 33, 34.

(In both this and the preceding plate the drawings are almost entirely based upon personal observation, though certain forms have been adapted from Thayer's valuable monograph.)—(*Greene's Medical Diagnosis*)

15 grains at a dose. In pernicious paroxysms this may be repeated several times at intervals of 3 or 4 hours, after which time it is generally advisable to reduce the quantity. It should be remembered that in pernicious cases moderate fever may exist for some days after the parasites have disappeared from the blood. In such instances large doses of quinin should be discontinued.

Treatment of Hemoglobinuria.—The treatment of hemoglobinuria depends upon its relation to the malarial paroxysm. If acute malaria exists, as revealed by the presence of actual parasites, quinin should be administered intravenously or hypodermically. On the disappearance of the parasites it is advisable to reduce the quantity of quinin, continuing treatment as in any other case. If the parasite is absent, the case should be treated symptomatically—with rest and careful diet and tonics. Recrudescence of malarial paroxysms after an attack of hemoglobinuria should be treated in the ordinary manner. See Blackwater Fever.

The treatment of the various sequels of malarial fever presents no special points.

Arsenic has a well-established reputation in the treatment of the grave **postmalarial anemias** and **cachexias.**

℞.	Arsenic,	gr. ⅔
	Quinin,	gr. xl
	Reduced iron,	ʒij
	Extract of gentian,	q. s.

Make 30 pills or capsules. One pill or capsule after each meal.

The new arsenical compounds, especially sodium cacodylate, are recommended.

In some of these instances the removal of the patient to a healthy region where there may be no danger of a reinfection may be imperative.

MAL DE MER.—See Sea-sickness.

MALE FERN.—See Aspidium.

MALIGNANT EDEMA.—See Gangrene.

MALIGNANT PUSTULE.—See Anthrax.

MALINGERING.—The feigning of disease. The simulation of various morbid conditions is common. There are many cases of professional malingering, principally encountered by street car, railroad and accident insurance companies. The surgeon of the army, or navy, or prison must especially be on his guard against malingering. In the voluntary and short service attempts are not so usual. Headaches, rheumatism, colic, diarrhea, and other more or less subjective affections are complained of. In continental armies, mutilation and resort to imitation of chronic diseases are comparatively common. To avoid conscription, an infinite variety of artifices is resorted to. Functional affections so closely simulate organic disease that suspicion is often disarmed. Hysteria or neurasthenia explains the greater number of cases, a deranged nervous system being responsible. In these cases the simulation may be voluntary. In other cases the patient may voluntarily exaggerate symptoms or add new ones to those already present. In a third group of cases fraud is attempted, through some strong motive, by deliberate simulation of an injury or disease. Paraplegia, incontinence of urine, joint affections, in short, almost any disease which does not admit of palpable objective demonstration, may be feigned. A sudden shock, the pressure of poverty, or the absolute necessity for immediate exertion will often effectually and permanently arouse a bedridden hypochondriac of years, and restore him to usefulness and his friends.

When face to face with the deliberate malingerer, natural cunning must be overcome by the superior sharpness of science. Incontinence of urine, dysentery, hemoptysis, jaundice, and insanity are among the most favorite rôles of such persons. The yellow conjunctivæ of jaundice can hardly be feigned; incontinence of urine is often found attended by an expulsive effort; blood from the lungs is not always mixed with pulmonary mucus, and blindness, deafness, or paralysis are not always proof against some shock or mental impression. A blood test will determine whether an anemia is genuine or not. The X-ray will expose a feigned fracture. Skin lesions deliberately produced can be detected by the application of a fixed plaster-of-Paris dressing. Simulated cancer is readily disproved by microscopic examination. The stethoscope and absence of bacilli and fever will expose feigned tuberculosis. Epilepsy that is simulated may be detected by a hypodermic of apomorphin or a pinch of snuff. Feigned blindness and deafness may be discovered by special tests. See Blindness, Ear (Examination). Electricity may clear up apparently anomalous nervous symptoms; the stethoscope and sphygmograph record the actual condition of the heart. Administration of chloroform or ether will expose feigned contractures, wry neck, paralysis, as well as unconsciousness. Simulated unconsciousness, or anesthesia, may be detected by the electric current. Subjective sensations are hard to detect, and it is often well to give a patient the benefit of the doubt.

MALLEIN.—An extract, in glycerin, of the products of cultures of the bacillus mallei, the microorganism of glanders. When injected into animals suffering from glanders, it causes a marked febrile reaction, as does tuberculin when injected into animals suffering from tuberculosis. See Glanders.

MALPRACTICE.—A term applied to the treatment of a disease that is contrary to that taught by experience, or a failure on the part of a medical practitioner to use such skill, care, and judgment in the treatment of a patient as the law requires; and thereby the patient suffers damage. If due to negligence only, it is *civil malpractice.* But if done deliberately, or wrongfully, or if gross carelessness or neglect have been shown, or if some illegal operation (such as criminal abortion) be performed, it is *criminal malpractice.* See Abortion.

MALT.—The seed of common barley, germinated until the maximum amount of diastase, the ferment that converts starch into grape-sugar, is developed. It is nutritive and valuable also, for the diastase, which aids in the digestion of farinaceous foods. It is employed in wasting diseases, preferably mixed with milk. Many popular "foods" consist mainly of granulated extract of malt. **M. Ext.,** the soluble principles of malt, mainly diastase and glucose, in a concentrated form, unfermented. Dose, 1 to 8 drams. **M. Liquors,** fermented and clarified solutions of malt that have been subjected to vinous fermentation, hops being added to prevent acetous fermentation subsequently. *Beer* is made by a comparatively slow fermentation, and contains about 2.5 percent of alcohol. *Ale* and *porter* are fermented more rapidly, and contain about 4.7 per cent of alcohol. The malt used in making porter is browned, giving the liquor a darker color. Malt liquors contain about 5 percent of albuminous matter, 2 of phosphates, and 1 of carbon dioxid.

MALTA FEVER. Synonyms.—Mediterranean Fever, Neapolitan Fever, Rock Fever, Undulant Fever. An endemic fever observed along tropic or subtropic sea coasts or river banks, of irregular course, with undulatory pyrexial relapses, profuse sweats, rheumatic pains, arthritis, and enlarged spleen. It occurs chiefly in the countries bordering on the Mediterranean Sea. A number of cases have been observed, however, in Porto Rico, Cuba, the Philippine Islands, etc. The disease attacks most frequently the young.

Etiology.—The cause of this infectious disease, the micrococcus melitensis, discovered by Bruce, is found in the spleen. It generally occurs singly, occasionally in pairs, or in chains, is aerobic and nonmotile, although according to some observers it has one or several flagella, and grows fairly well upon the ordinary media such as agar. Pale colonies are observed in about three days.

In most cases infection can be traced to goat's milk, but not always. Even mere contact with the infected goats or with their blood may transmit the disease. Laboratory infection seems to occur more readily with Malta fever than with glanders or plague. A case is reported in which the probable source of the contagion was the patient's habit of laying his cigarette from time to time on his work table.

Symptoms.—After an incubation period of about a week the disease develops gradually, the onset being marked by headache, anorexia, insomnia, and lassitude. The disease is of long and indefinite duration. The undulations of pyrexial intensity are the most constant and characteristic feature of the disease. Constipation, profuse perspiration, and frequent symptoms of neuralgic and of arthritic nature accompany its course. There is enlargement of the mesenteric glands. The spleen, too, is enlarged and softened after death, and many of the other organs are congested, but Peyer's patches are not enlarged or ulcerated, and ulceration is not present in other parts of the small intestine. There are no red spots.

Diagnosis.—The disease may be overlooked because of its infrequency. It may be differentiated from typhoid fever by the negative Widal test, by the study of the temperature chart, from malarial fever by the absence of the plasmodium of malaria in the blood and by the therapeutic test. A most valuable means of diagnosis is the agglutination test—the serum of the patient's blood reacts upon fresh cultures of the micrococcus melitensis. The blood is allowed to stand for 24 hours, the serum pipeted off, and it is diluted to a given degree, say 1:11, with distilled water, or even 1:22, with normal saline solution, and added to some of the pure culture of the micrococcus. In distilled water the micrococcus retains its motility and does not clump for an indefinite time. With serum from a typhoid patient no reaction occurs. A control test should be made with normal blood serum from a healthy person.

Treatment.—The general measures indicated for typhoid fever are advised. An initial dose of calomel or castor oil should be given. Food should be liquid during the febrile period, and either the cold bath or pack used every time the temperature reaches 103° F. Symptomatic treatment is otherwise indicated. No drugs have any special influence on the fever. Serum therapy does not seem very promising. One case, however, is reported to have been cured by the administration of Malta fever antitoxin. During convalescence iron and plenty of nourishing food are indicated. A change of climate may promote convalescence.

MAMMARY ABSCESS.—See BREAST (Diseases).

MANGANESE.—Mn = 54, quantivalence II, IV. A silver-white metal having the general properties of iron. It is used in medicine and pharmacy in the form of oxid, sulphate, permanganate, and hypophosphite.

Therapeutics.—The salts of manganese in small doses improve the appetite and the digestion and stimulate the action of the heart. Potassium permanganate is a powerful oxidizing agent, and hence is actively antiseptic, disinfectant, and deodorant; but its germicidal power is limited. It is considered by some authorities to be an efficient emmenagog. Used internally, it is probably not absorbed in its own state.

The salts of manganese are used in amenorrhea. gastrodynia, and pyrosis, and in many skin-diseases and in jaundice. Manganese is becoming more of an acknowledged remedy in derangements of the menstrual function, as irregular or scanty menstruation, amenorrhea, menorrhagia, and even metrorrhagia. The best preparation is the dioxid, in freshly made pills of 2 grains each, of which 1 to 5 pills may be taken twice or thrice daily.

Potassium permanganate has generally been the preparation given when the effects of manganese were desired; but it is a difficult matter to get patients to take it for any length of time. It is employed as an antiseptic and oxidizing agent in such affections as diphtheria, scarlatina, septicemia, erysipelas, etc., in which it may be given internally and used locally at the same time. It is given with apparent benefit in dyspepsia, flatulence, lithemia, and obesity, and has often seemed to be of service in acute rheumatism. In amenorrhea it is reported to be very efficient, and has lately been used with success as a remedy for the bites of venomous serpents and for other animal poisons. For internal use the drug should be given in pill, as the taste of a solution is very disagreeable. Locally, it is frequently employed (1 dram to the pint) to correct fetor in cancer, ulcer, caries, abscesses, ozena, and it will destroy the odor of a foul breath or that of the fetid perspiration of the feet. It is used both as a test and as a corrigent for organic impurities in drinking-water. The stain left on fabrics may be removed by sulphurous acid, but, as sulphuric acid is formed in the reaction, the fabric should be immediately washed or rinsed in water. Potassium permanganate has lately come into use as an antidote against morphin or opium in the stomach. It exerts no oxidizing effect, in the presence of albumin, on atropin, hyoscyamin, hyoscin, caffein, cocain, aconitin, veratrin, pilocarpin, muscarin, or phosphorus (Murrell).

Preparations.—M. Dioxidum Præcipitatum, is chiefly manganese dioxid, MnO_2, with small amounts of other oxids of manganese; a heavy, fine black powder, odorless and tasteless, insoluble in water or alcohol, giving off oxygen gas at a red heat, and if heated with hydrochloric acid it causes the evolution of chlorin gas. Dose, 2 to 10 grains. **M. Sulphas,** colorless prisms, of slightly bitter and astringent taste and faintly acid reaction, very soluble in water, insoluble in alcohol. Dose, 2 to 6 grains. **Potassii Permanganas,** deep, purple-violet prisms, of sweet and astringent taste, neutral reaction, soluble in 16 parts of water with a scanty, brown residue, decomposed by alcohol and heating to 464° F. It should be kept in well stoppered bottles, and should not be triturated or combined in solution with organic or readily oxidizable substances. Dose, 1/2 to 2 grains in pill. For the **Hypophosphite,** see PHOSPHORUS.

MANIA.—A form of insanity marked by great exaggeration of nervous action. It may occur suddenly or follow an attack of melancholia. The patient presents an infinite variety of moods, is the subject of hallucinations and illusions, often shows a tendency to destroy what he comes in contact with, and is untidy; there is a marked change in character and decided insomnia. There is rapid and progressive emaciation. The brain is found to be in a hyperemic condition. The disease is probably due to a loss of the inhibitory action of the highest controlling centers of the brain. Mania is most common in young adult life. Heredity is a strong predisposing cause, while mental strain, bereavements, shocks, and alcoholism may act as exciting causes.

Varieties.—Acute delirious mania, typhomania, is a psychosis of sudden onset, attended with increased bodily temperature, and marked by delirium with sensuous hallucinations, marked incoherence, restlessness, refusal of food, loss of memory, and rapid bodily wasting, terminating frequently in death.

The term **menstrual mania** is often used for attacks of mania occurring at the menstrual epoch. Homicidal, suicidal, and various hysteric impulses are common.

Mania-a-potu is an attack of acute delirium during a debauch, or in those who have drunk heavily and eaten little for a comparatively short time. See ALCOHOLISM.

Asthenic mania is mania in which there is a general anemia associated with neurasthenic symptoms. See HYSTERIA, NEURASTHENIA.

Dancing mania is a hysteric mental state in which, through sympathy and imitation, dancing of a most grotesque and extravagant character occurs. Usually epidemic.

Delusion mania is the result of fixed delusions, either causing or associated with the maniacal outbreak. See DELUSION.

Erotic mania, erotomania, presents systematized delusions of an erotic character, not necessarily accompanied by animal sexual desire.

Nymphomania is a morbid, irresistible impulse to satisfy the sexual appetite, peculiar to the female sex.

Epileptic mania follows an epileptic paroxysm, and is often of a most violent kind, the maniacal acts being of the most treacherous and malicious character. See EPILEPSY.

Hallucination mania presents visual, olfactory, and other sense hallucinations. See HALLUCINATION.

Homicidal mania is any variety of mental disease in which there is a desire or an attempt on the part of the patient to commit murder. The condition may be the result of delusions that the persons attacked either are persecuting or going to kill the patient, or of the excessive excitement that vents itself in destructiveness, combativeness, or desire to kill; or there may be a morbid desire, impulse, or craving to do murder, or the homicidal act may be unconsciously done during an acute delirium or a paretic or epileptic maniacal impulse.

Morphinomania is the insane craving for the stimulating action of morphin—a moral insanity. See OPIUM.

Puerperal mania is the maniacal outbreak occasionally seen in puerperal women. This is now thought to be of septic origin, although the mental strain through which the female has been passing is a predisposing factor.

Recurrent mania, or chronic mania, with lucid intervals of longer or shorter duration. Generally of alcoholic origin.

Transitory mania, or ephemeral mania, is a rare form of maniacal excitement, of sudden onset, violent and decided in character, accompanied by great insomnia, incoherence, and more or less complete unconsciousness of familiar surroundings. The attack as suddenly terminates, the duration being from a few hours to a few days.

Senile mania is the mental exaltation occurring in persons with senile arterial changes or senile cerebral atrophy. It is soon followed by dementia.

Prognosis.—In about 50 percent of the cases of acute mania not due to organic disease, the patients recover after periods varying from 1 month to several years. A fair proportion make a partial recovery and are able to return to their work, but always showing some alteration in character or affection or some eccentricity or a slight mental weakness. About 20 percent terminate in dementia or mental death, and this is always the fear in each case. Two percent die, either the result of exhaustion or from the organic condition causing or associated with the attack. The question of recovery, partial or complete, is always difficult to determine, depending upon the cause, temperament, disposition, education, nationality, and the normal mentality of the individual. Recovery is usually gradual; rarely sudden restoration occurs.

Treatment.—Persistent administration of drugs appears to have a deteriorating influence on the nerve-centers and their routine use is condemned. It is not advisable to restrain disorderly actions by mechanic means. The best measure to adopt in acute mania is to get the patient to be in the fresh air and work off as much excitement as possible by muscular exercise. Walking a patient about all day will often prove the best hypnotic, and sleep obtained in this way is more valuable than that procured through drugs. In acute cases forced feeding is sometimes necessary, and it is important that abundant nutriment be introduced into the system. Stimulants are often useful, and should be given with food. A dry tongue is an indication for pushing the administration of food and stimulants. Acute mania is with difficulty treated at home, and it is often advisable to remove the patient from his home surroundings. Moral treatment is far more efficacious than drugs in acute mania. In acute delirious mania the great effort should be to produce sleep by various methods. Opium must not be given, as it may produce a slight narcotism for a short time only, and, if the dose is increased, narcotic poisoning and death ensue. Hyoscin finds its greatest and most useful application in maniacal violence and noisiness. Coniin, 1/2 to 3 minims, or 1/10 of a grain hypodermically, conjointly with morphin, is used in acute mania. Duboisin, 1/100 of a grain hypodermically; or 1/100 of a grain by the mouth, gradually increased to 1/30 of a grain of hyoscyamus, when there is no congestion; chloral and bromids, large doses of gelsemium, as 15 to 30 minims, stramonium, belladonna, daturin, veratrum viride, and camphor, cannabis indica, paraldehyd, and digitalis are variously useful. Tincture of iron chlorid, in 5- to 10-minim doses, is of benefit as a restorative in chronic mania. Croton oil, 1/4 to 1/3 of a minim, every hour, is used as a revulsive in mania from acute congestion of the brain. Cimicifuga is often efficient in puerperal mania or that of a pregnant condition. It may be necessary, to temporarily control violent cases, to employ chloroform by inhalation. The cold douche applied to the head while the patient's body is in a warm bath is of service in maniacal delirium. In congestive cases, ice may be applied to the head. Galvanism is also applied to the head and cervical sympathetic region in chronic mania. See DELIRIUM.

MANNA.—The concrete, saccharine exudation of *Fraxinus Ornus*, the flowering ash, and other trees. It contains from 40 to 90 percent of *mannit*, or manna-sugar, which does not undergo vinous fermentation, and is chemically allied to the alcohols and to glycerin. It also contains glucose, mucilage, some acrid resin, and a small quantity of the glucosid, *fraxin*. There are no official preparations, but manna itself may be given in doses of 1 to 8 drams. Manna is a mild laxative, with some tendency to produce flatulence and colic. It is usually combined with other purgatives, as senna, rhubarb, and magnesia, to disguise the taste and increase the effect. It is a constituent of the official infusum sennæ compositum. Manna may be administered dissolved in milk.

MARASMUS (Infantile Atrophy; Simple Wasting).—The form of wasting termed marasmus is a nutritional disorder, and occurs independently of any constitutional disease, as tuberculosis or syphilis, in which diseases, of course, an extreme condition of wasting is seen.

Etiology.—Marasmus occurs in bottle-fed babies. It is rare in country children, and in those in the city who have good care and hygienic surroundings, but is common in dispensary practice, among the poor and neglected. The principal causes, therefore, are improper feeding, and lack of sunlight, fresh air, and healthful surroundings. Excepting the atrophied condition of the muscular system, there are no characteristic pathologic lesions. All the organs after death may be found in an apparently normal condition.

Symptoms.—The symptoms are those of starvation—the child steadily loses weight and strength. The eyes are large and sunken, the fontanels usually open, the skin becomes wrinkled and hangs from the bones in folds, and the child presents an old appearance. The appetite, which early may have been good, diminishes, and after a time becomes nearly lost. In other cases it is irregular, being ravenous at times. The bowels may be normal, but are more often constipated or irregular, and contain a large proportion of curds. Vomiting at times is a prominent symptom. The child is usually listless or apathetic. The temperature is generally subnormal (96° to 97° F. per rectum). Unless arrested by treatment, the course is steadily downward, death occurring from the extreme degree of malnutrition or exhaustion, or from an intercurrent disease.

The prognosis in a child under 6 months old is very unfavorable, and even while they are improved by treatment, relapses are likely to occur. Older children more frequently recover.

Treatment.—Hygienic treatment is important, and consists in daily bathing, massage with oil, warm clothing, and, if the temperature is subnormal, external heat by hot-water bottles, etc.

In order to expand its lungs the child should be made to cry once or twice a day by mild flagellation or alternate hot and cold baths.

The principal treatment is the institution of proper feeding. When practicable, wet-nursing will be the best means of giving nourishment, but in cases in which this method cannot be used, a properly modified milk diet must be given. No set rules can be laid down for all cases, as the digestive powers will be found to vary, but generally a mixture, such as that given below, will be found to agree with a weak child 4 or 5 months old:

℞.	Cream, Whey, Water, each,	℥ j
	Sodium bicarbonate,	gr. x
	Milk-sugar,	1 teaspoonful.

This may be partially peptonized by adding extract of pancreatin, or peptogenic milk powder, and allowing to stand in a temperature of about 110° F. for 8 or 10 minutes. It should be given from a bottle every 2 hours, and as the child's digestive powers increase, the amount should be increased, and later milk substituted for the whey.

No medicines internally are of any use in marasmus, but any indications should be properly met, and it is well to begin the treatment by giving, for 2 or 3 days, mercury in small doses to clear out the intestinal tract.

℞.	Mercury and chalk,	gr. ij
	Sodium bicarbonate, Sugar of milk,	each, gr. xij.

Mix and make 12 powders, and give 1 every 2 hours until 4 are taken, repeating daily for 3 days, and giving every morning following about 1/2 a teaspoonful of magnesia dissolved in milk or water.

The child should be weighed regularly, as this is the only reliable means of judging as to its progress. See INFANT FEEDING, MILK (Modified).

MARJOLIN'S ULCER.—An epithelioma developing from the edge of a chronic ulcer or an old scar. It is very painful and secretes a foul discharge. Late in its course the anatomically related lymph nodes become affected. Diagnosis may be made by excising a piece of tissue from the margin of the ulcer and examining it with the microscope.

Treatment consists in free extirpation of the diseased area together with removal of the associated lymph nodes; and, in advanced cases in which the diseased area is upon an extremity, amputation is demanded.

MARRUBIUM (Hoarhound).—The leaves and tops of *M. vulgare*. They contain a bitter principle, *marrubiin*, and a volatile oil. In small doses hoarhound is a mild stomachic tonic; in larger doses a laxative, diuretic, and diaphoretic. It exerts a soothing effect in catarrh of the nasal passages, and is, therefore, an ingredient of various cough mixtures. Dose, 20 to 60 grains.

MARSH-FEVER.—See MALARIAL FEVER, MALTA FEVER.

MARSH-MALLOW.—See ALTHÆA.

MASSAGE.—A method of effecting changes in the local and general nutrition, action, and other functions of the body by rubbing, kneading, and other manipulations of the superficial parts of the body by the hand or an instrument. A male operator is called a *masseur*, a female operator a *masseuse*. Persons skilled in massage should have a general knowledge of the superficial anatomy of the body and the position of the chief organs. Massage means treating the soft parts, muscles, organs, etc., only, while by Swedish movements is meant the movements of the joints, as flexion, extension, adduction, abduction, pronation, supination, traction, etc.

Metzger, of Wiesbaden, divides massage into 4 principal manipulations:

1. **Effleurage (Stroking).**—(1) With palm of one hand, used on small surfaces. (2) With palms of both hands, used on large surfaces (is most generally used). (3) With thumb or thumbs, on tendons or between muscles or small surfaces. (4) With tips of fingers, on tendons or between muscles or small surfaces. Light stroking has a soothing influence on the system; heavy stroking has a stimulating influence on the superficial structures, increasing the arterial, venous, and lymphatic circulation.

2. **Frictions (Firm Circular, Semicircular, or To-and-fro Motions).**—(1) With one hand, used on small surfaces. (2) With both hands, used on large surfaces. (3) With thumb or thumbs, used on small surfaces, as the face, below the eyes, hand, around joints. (4) With tips of fingers, used on small surfaces, as the face below the eyes, hand, around joints. This manipulation reaches deeper than the former, to the subcutaneous connective tissue and fat overlying the muscles, its aim being to transform pathologically changed parts into a condition that will permit them to be incorporated into the healthy tissues by absorption by the veins and lymphatics.

3. **Pétrissage (Kneading or Pinching).**—(1) With two thumbs, used to get the effect upon a certain small localized area. (2) With thumb and fingers. (3) With two hands, used on large surfaces. (By pinching is meant the squeezing of the muscles between the fingers and the fleshy part of the palm.) The aim of this manipulation is to reach the separate muscles or groups of muscles; to reach as deep as possible; to cause circulatory, nutritive, and alterative changes in the soft tissues within reach—muscles, tendons, organs, etc.

4. **Tapotement (Tapping or Percussing).**—(1) Clapping, used with palms of both hands. (2) Hacking, used with ulnar border of hands. (3) Pinctating or titillation, used with tips of fingers with a shoving motion. (4) Beating, used with clenched hand, with the ulnar edge, or with the knuckles. These manipulations are mainly used on muscular parts, as the back, back of legs, gluteal region, and well-developed subjects in general.

It is well known that the circulation at the surface is not so active as that of the interior of the body; therefore in massage effleurage is applied first in order to warm the surface—to stimulate the blood and lymph changes, to remove the old epithelial scales, that the pores and sebaceous glands may be freed from matter which causes obstruction. The frictions which are next applied reach a little deeper. Pétrissage goes below the skin and fat overlying the muscles, and reaches the muscular structures and deep-lying organs. Tapotement imparts its stimulus to the deepest structures.

General massage is useful when the nutritive functions are to be extensively stimulated, when tissue changes in the different organs are to be promoted and the excretion of waste products increased.

Local massage accelerates the circulation in the blood-vessels and lymphatics and greatly increases the nutrition in the parts, promotes excretion, makes muscles firmer, and increases muscular power. It is of especial value in infantile paralysis, in cases in which splints or supports have been worn for a long time, in hysteric affections of the joints and limbs, and in long-standing paralysis.

Massage is applied to the abdomen in cases of atonic dyspepsia with flatulent distention. In constipation a course of kneading and rubbing throughout the length of the colon may lead to regularity of action, and is of especial value in cases of fecal accumulations. See CONSTIPATION.

MASSES (Massæ).—Pill masses are official under this name. There are two official masses:

Massa Ferri Carbonatis.—100 gm. ferrous sulphate; 46 gm. monohydrated sodium carbonate; 38 gm. clarified honey; 25 gm. sugar; syrup and distilled water, each q. s. Dose, 4 grains.

Massa Hydrargyri.—33 gm. mercury; 10 gm. glycyrrhiza; 15 gm. althæa; 9 gm. glycerin; honey of rose, 33 gm. Dose, 4 grains. See PILLS.

MASSOLIN.—A pure culture of the bacillus bulgaricus of Massol. The culture has the tendency to prevent the growth of pathogenic and pyogenic organisms. It is recommended in suppurative conditions.

MASTIC (Mastiche).—A concrete, resinous exudation from *Pistacia Lentiscus.* Alcohol dissolves about 90 percent, including the resin, *mastichic acid,* the remainder consisting of another resin, *mastichin,* which is soluble in ether and resembles copal. There are no official preparations, but mastic is an ingredient of the official Pil. Aloës et Mastiches. Dose, 20 to 45 grains.

Mastic was formerly used for supposed properties analogous to those of other oleoresins, but its application is now confined to dentistry, being employed as a temporary filling for carious teeth. A solution in ether is applied on cotton with moderate pressure, and remains as a firm plug after evaporation of the solvent.

MASTITIS.—See BREAST (Diseases).

MASTOID DISEASE, AND OPERATION.—See EAR (Disease of Middle).

MASTURBATION.—Production of the venereal orgasm by the hand. The evils arising from this habit have been generally exaggerated. With children, if there is any cause, such as an adherent prepuce, phimosis, or a very long foreskin, circumcision will generally effect a permanent cure. The operation makes a distinct break in the habit, and, combined with close supervision and good moral treatment, complete emancipation may be obtained. In girls cleanliness of the genital organs, with close supervision, may remove the trouble. With older girls only moral treatment will be of use. The practice is often a symptom of mental deficiency or the first indication of psychologic disturbance, and has too often been regarded as the cause instead of the result of insanity. Moral treatment failing, mechanic methods, such as tying the hands after undressing at bedtime, arranging so that the patient does not sleep alone, or fastening a hard body, like an empty cotton-reel, over the spine, so that resting upon the back will be prevented, may be tried. Blistering the penis or labia is a severe measure, and, used alone, is not likely to be followed by any permanent benefit. Free purgation or regular emptying of the rectum, and the removal of thread-worms or anal irritation are not to be overlooked. Bad companions, filthy conversation, and impure literature are to be avoided. Open-air exercise, pushed to fatigue; plain, unstimulating food; and change of amusements and surroundings, will improve the physical tone. Drugs are not to be depended upon when there is a continual struggle between an unhealthy sexual appetite and a weakened will. Potassium bromid or sodium bromid, with potassium iodid and cold baths, are occasionally used with benefit. Blistering of the occiput and upper cervical spine may be occasionally useful in allaying excitability of the sexual centers. It is a question whether warnings against the evils of the practice, of which nothing is known, will prevent or promote indulgence in it. Such warnings must be most judiciously administered to innocent and sensitive youths.

MATCHES, Poisoning by.—See PHOSPHORUS (Poisoning).

MATICO.—The leaves of *Piper angustifolium,* containing a crystallizable acid *artanthic acid,* also resin, tannin, and a volatile oil. Its odor is aromatic, and its taste astringent, spicy and somewhat bitter. Dose, 1/2 to 1 1/2 drams.

Matico is an aromatic tonic and stimulant, also aphrodisiac, vulnerary and hemostatic. It acts like cubeb on the urinary passages, and is an excellent alterative stimulant to mucous membranes. It has been used with considerable success in mucous catarrhs, as gonorrhea, leukorrhea, and chronic cystitis, also in epistaxis, hemorrhoids, menorrhagia, hemoptysis, hematemesis and other hemorrhages. The under surface of the leaf is so formed as to promote coagulation of blood if applied to a bleeding surface, and is a good local hemostatic for trivial cuts or wounds.

Fluidextractum Matico.—Dose, 1/2 to 1 1/2 drams.

MATRICARIA.—The dried flower-heads of *Matricaria chamomilla,* German Chamomile. They contain 1/4 percent of a blue volatile oil, the color of which is due to *azulen,* also a bitter extractive, tannin, etc. There are no official preparations, but the flowers may be eaten or a decoction used almost *ad libitum* (average dose, 4 drams).

Matricaria is a mild tonic, in large doses emetic, anthelmintic and antispasmodic. It is much used in Germany, and in this country is a popular domestic remedy among German people, who use it in infusions as a diaphoretic. It is the *chamomilla* of the homeopaths.

MAXILLARY SINUS.—See NOSE (Accessory Sinuses).

MAY-APPLE.—See PODOPHYLLUM.

MEAL, TEST-.—See STOMACH-CONTENTS (Examination).

MEASLES (Morbilli; Rubeola).—An acute, infectious, highly contagious disease, characterized by a well-marked prodromal stage, with coryza and fever, followed by a characteristic eruption on the face and body. While probably due to a **microorganism,** the proof of this is wanting, as the specific germ has not yet been determined.

Measles occurs in wide-spread epidemics, being most common in the spring of the year. It is **contagious** from the time of the beginning of catarrhal symptoms, being most contagious during this period and while the rash is coming out. With the fading of the eruption and subsidence of the catarrh the communicability diminishes.

The duration of the infective period is about 3 weeks, or as long as the patient is desquamating or the cough remains. Children of all ages over 6 months are very susceptible to measles, and they usually contract it the first time they are fairly exposed to the contagion. Exceptions to this rule occur, some persons not having the disease, though exposed, until later life; others, not withstanding exposure, never contract it.

One attack usually, though not always, confers immunity. Direct contact with a patient is usually necessary, the infection seldom being carried by a third person, or in fomites, the poison not having the power to cling long to clothing or apartments, as does that of scarlet fever.

The period of incubation is 7 to 14 days, and if 16 days, at the longest, elapses after exposure without the disease developing, the person may be considered safe from the attack.

The pathologic lesions of measles consist of a superficial inflammation of the skin and a catarrhal inflammation of the mucous membranes, including, in some cases, besides the conjunctiva and upper and lower respiratory tracts, which are so constantly affected, those of the middle ear, intestinal tract, and vulva as well. Sometimes in severe cases a pseudomembranous exudate is present in the throat.

Symptoms.—The prodromal or catarrhal stage is characterized by the symptoms of a "cold," with lacrimation and photophobia, coryza, and a hard bronchial or, sometimes, a croupy cough. The child is irritable and peevish. A somnolent condition is often present at this time, and in some cases a headache or earache is complained of. Rarely a convulsion marks the onset. The tonsils and fauces are usually congested, but not so severely as in scarlet fever. The cervical lymph-glands are in many cases enlarged early. The temperature during this stage is elevated, varying from 100° to 104° F., which increases until the rash is fully developed.

The symptoms mentioned, when occurring in a child, strongly suggest the probability of an attack of measles; and when on the second or third day there are seen on the hard palate papules of a dark purplish color, a diagnosis may safely be made without waiting for the eruption to appear upon the skin.

Koplik's spots—which are characteristic, minute bluish-white spots on a reddish punctate area—may be observed on the mucous membrane of the cheeks and lips, in the preeruptive stage of measles. They usually disappear when the skin eruption is at its height. The specks observed in thrush have a more yellowish center.

The eruptive stage usually begins on the fourth day, the rash appearing on the neck, forehead, trunk, and extremities, in the order mentioned, taking about 4 days to spread over these parts. The eruption consists of small papules on a slightly reddened base, and is never vesicular or pustular in character. The surface is covered in patches, which sometimes assume a crescentic shape, between which is seen the normal skin. The face, as a rule, is more generally covered than the other parts, and it has a swollen appearance, especially about the nose and eyes.

The rash remains for from 1 to 6 days—4 days on the average—and begins to fade on the parts first affected, while it may still be appearing elsewhere. By the fifth or sixth day of the disease the fever, cough, and other symptoms subside rapidly (their continuance after the rash is fully out would indicate some complication), and by the eighth or tenth day after the beginning of the prodromal symptoms the eruption, except for a mottled discoloration of the skin, which may remain for a few days or a week, has entirely disappeared, and in favorable cases convalescence is rapid. Desquamation of a fine, branny nature is usually seen following the fading of the rash.

The severity of measles markedly varies, some epidemics being quite uniformly of a mild, and others of a severe, type. Different individuals are also more or less severely affected, depending greatly upon the season of the year, the condition of the patient, and the surroundings and care. The severe cases occur more frequently among infants than among older children. In some instances there is no fever and the exanthem is trivial or even absent.

Complications and Sequels.—Bronchopneumonia is the most common complication. Catarrhal or sometimes membranous laryngitis, chronically enlarged lymphatic glands which are apt to become tuberculous, catarrhal or purulent otitis media, conjunctivitis, endocarditis, vulvovaginitis, and, especially in the summer months, intestinal disorders, as enterocolitis, are quite frequent. Keratitis and severe conjunctivitis occur among poor children and may persist for a long time. In many cases the health of the child remains impaired for a long time, and the danger of tuberculosis following measles in a delicate child should be remembered.

Diagnosis.—The fact that the patient has been exposed to the infection, or that there are other cases in the neighborhood, is always a valuable point in reaching a diagnosis in any of the contagious diseases. The marked coryza and dread of light, the erythema of the mouth and fauces, the presence of Koplik's sign, the quite uniform period of incubation, and the characteristics of the rash must all be considered. In certain mild or irregu-

	MEASLES.	VARIOLA.	VARICELLA.	SCARLATINA.	RUBELLA.
Incubation	10 days	12 days	17 days	4 days	12 days or longer.
Prodromes	3 days. Coryza, cough, etc. Koplik's spots.	3 days. Rigor, high fever, headache, lumbar pains.	A few hours or often none. Very slight.	24 to 48 hours. Angina, vomiting, rapid pulse, high fever.	A few hours. Slight catarrh, etc.; usually enlarged cervical glands.
Character of eruption.	Bluish papules; swelling of face; discrete or confluent circular outlines.	Macules, papules, vesicles, and pustules; discrete or confluent.	Vesicles, discrete...	Erythema; scarlet color, confluent or punctate.	Papules; discrete or confluent in patches; rosy color.
Parts first affected.	Forehead, face, or neck.	Forehead	Face, scalp, or shoulders	Neck, face, and chest.	Face.
Desquamation	Furfuraceous	Large crusts	Small crusts.	Lamellar	Slight, furfuraceous
Duration	7 to 10 days	3 weeks	1 week	7 to 10 days	1 week.
Complications and sequels.	Eye and lungs; tuberculosis.	Larynx and lungs..	....	Kidney, ear, and heart.	

lar cases a concluson can be arrived at only after carefully weighing the symptoms as a whole.

The foregoing table gives the principal points of difference in the eruptive diseases. See EXANTHEMS.

The prognosis in healthy children, under favorable surroundings, is good; but in tuberculous and wasted children, especially when there are serious complications and sequels, it may be of a grave or fatal character. Occurring before the fifth year, measles is a much more dangerous disease than after that age.

Treatment.—Infants and weak children should be carefully protected from exposure to measles. The patient should be isolated in order to prevent the spread of the disease. He should be placed in a large, darkened, well-ventilated room, the bed being protected from drafts by a screen, and when the laryngeal symptoms are severe, the air in the room should be kept moistened with steam. The patient should be kept in bed until the temperature has been normal for a week, and kept in the house for at least a week longer. Water or acidulated drinks, as weak lemonade, should be freely given, as the thirst is usually great. The diet during the febrile stage should be liquid, milk being the best. There are no remedies which will cut short the attack. The treatment is symptomatic and directed toward making the patient as comfortable as possible and protecting against complications. When the case is first seen, an enema or a mild laxative, such as castor oil, to act upon the bowels, is beneficial, being careful, owing to the irritability of the intestinal tract, not to produce too marked an effect in this direction.

For the bronchial cough and the fever, the following mixture is very useful:

℞.	Potassium citrate,		ʒ iv
	Lemon-juice,		℥ j
	Camphorated tincture of opium, Syrup of ipecac,	each,	ʒ ij
	Syrup of tolu,	q. s.	℥ iij.

Give 1/2 to 1 teaspoonful every 2 or 3 hours.

When there are nervous symptoms, manifested by headache, restlessness, etc., phenacetin or acetanilid, 1/2 grain for each year of the child's age, given every 3 or 4 hours, will give relief.

The eyes should be bathed 2 or 3 times a day with a solution of boric acid (10 grains to the ounce) or with the following:

℞.	Mercuric chlorid,		gr. 1/100
	Zinc phenolsulphonate,		gr. iij
	Boric acid, Sodium chlorid,	each,	gr. xv
	Aqueous extract of hamamelis,		ʒ v
	Camphor-water, Distilled water,	each,	℥ jss.

Vaselin rubbed on the edges of the lids in the evening will prevent the eyelids from becoming glued together during the night.

For the coryza:

℞.	Menthol,	gr. x
	Liquid albolene,	℥ j.

Apply 2 or 3 times a day in the nares with an atomizer or with a piece of cotton wrapped on a probe.

From the beginning of the attack until desquamation has ceased, a warm bath (95° to 100° F.), followed by inunctions of cacao-butter, should be given daily; and when the temperature is high, sponging the body with cool or tepid water and alcohol, as in other febrile affections, may be safely practised.

The period of convalescence should be carefully watched, and the child allowed plenty of fresh air, but should be guarded against exposure to cold or damp weather.

Creosote and cod-liver oil should be given when there is a tendency to tuberculosis or when a cough remains.

MEASLES, GERMAN.—See RUBELLA.

MEASURES.—See WEIGHTS AND MEASURES.

MEAT.—See BEEF.

MEATUS, URINARY.—See URETHRA.

MEDIASTINUM, DISEASES.—The mediastinum is the space in the thorax between the pleural sacs, divided into 2 parts: the anterior, situated before, and the posterior, behind, the heart. In the anterior mediastinum are the remains of the thymus gland and the origins of some of the hyoid and laryngeal muscles. It is narrowed at the center, and in the lower part there is some areolar tissue, together with the left triangularis sterni muscle. The posterior mediastinum is larger than the anterior, and contains the aorta, the vena azygos, the thoracic duct, the esophagus and its nerves, the trachea, the splanchnic nerves, and some lymphatic glands. A middle mediastinum is sometimes described, containing the heart and the origin of its great blood-vessels, with the bifurcation of the trachea.

Emphysema of the mediastinum is the presence of air in the cellular tissue thereof, and sometimes exists apart from emphysema of the neck. It has been found in fatal cases of diphtheria in which tracheotomy has been performed.

Inflammation of the mediastinum gives rise to 2 prominent symptoms: dyspnea and severe pain referred to the poststernal region. Physical examination does not render much aid in diagnosis. In most cases of **abscess** in the anterior mediastinum some history of a cause is obtainable. If not, it is very difficult to distinguish between it and an aneurysm.

Surgical treatment, to open the abscess and establish drainage, is imperative. The inflammatory action is liable to spread, and to involve the lungs or the pericardium.

New Growths.—Almost every form of morbid growth has been encountered in the mediastinum—cancer, sarcoma, osteosarcoma, enchondroma, lymphadenoma, fibrous tumors, steatoma, lardaceous and tubercular masses, and syphilitic gummata. The growth of some is more rapid than that of others, and constitutional symptoms are more pronounced in some than in others. The duration of malignant intrathoracic growths is rarely more than a year. The more prominent symptoms are the cardiac, and the development is inward rather than outward, and only rarely do the chest-walls become eroded. Derangements of the circulation give rise to phenomena of diagnostic importance. It is not from pressure alone, but also from involvement of the vessels themselves, that the symptoms arise. Hemoptysis, sanguineous effusion into the pleura, and infarcts are frequent. Febrile disturbances are not marked, if at all present, at any time. Disturbances of innervation vary in severity and in character. Neuralgic pains are very common. Cough is either reflex or from bronchial irritation. Respiratory phenomena range from paroxysms of dyspnea to orthopnea.

Treatment.—Palliation of the most urgent symptoms is demanded. Bodily rest, freedom from moral disturbances, maintenance of general nutrition, change of air and hygienic conditions, are essential. Certain symptoms call for special treatment, such as counterirritation, sinapisms, and small blisters for pain. Opium, chloral, potassium bromid, and minute doses of antimony may alleviate the distress. Chlorodyne, Hoffmann's anodyne, and chloroform inhalations are often useful. Paracentesis may be resorted to, and iodin, chalybeates, and other constitutional methods may be employed.

MEDICINES, ADMINISTRATION. — Medicines may be introduced into the circulation by various routes, including the mouth, the stomach, the rectum, the respiratory tract, the veins and arteries, the subcutaneous cellular tissue, and the integument.

The mouth is the usual receptacle for medicines intended for the stomach, but may itself be employed for the introduction of minute quantities of powerful agents. A drop of the tincture of aconite placed on the tongue is quickly absorbed and soon manifests that fact by its symptoms. Many of the small tablets used for hypodermic administration, if placed under the tongue, are readily conveyed into the system, and, used in this way, form a very convenient means of medication with alkaloids and other active principles.

The stomach is the most convenient organ for the absorption of medicines and the one most frequently employed. After having been swallowed, the remedies find their way into the current of the circulation through the walls of the gastro-intestinal blood-vessels and the lacteals. When the stomach is empty and its mucous membrane healthy, crystalloid substances in solution pass rapidly through the walls of its vessels. *Colloid substances* (fats, albumin, gum, gelatin, etc.) require to be digested and emulsified before they can be absorbed. *Iodin* and *iodids* should be given on an empty stomach, so that they may diffuse rapidly into the blood; if administered during digestion, the acid gastric juice and the starch of the food will alter their chemic constitution and weaken their action. *Acids* should be given, as a rule, on an empty stomach, especially when they are intended to check the secretion of the acid of the gastric juice. *Alkalies*, of which sodium bicarbonate may be taken as the type, are given after meals to neutralize excessive acidity, and before meals to stimulate the acid gastric secretions. *Silver oxid* and *silver nitrate* should be administered after the digestive process is ended; if given during digestion, chemic reactions destroy or impair their special attributes and defeat the object for which they were prescribed. *Metallic salts* (especially corrosive sublimate), also *tannin* and pure *alcohol*, impair the digestive power of the active principle of the gastric juice, and should only appear in the stomach during its period of inactivity. *Malt extracts*, *cod-liver oil*, *phosphates*, etc., should be given with or directly after food, so that they may enter the blood with the products of digestion. *Bismuth* should be given before meals, as it is usually employed for its local sedative action on the gastric mucous membrane. *Potassium permanganate* should be given after meals, for in an empty stomach it would irritate the mucous membrane and might possibly produce ulceration thereof. *Arsenic*, and other irritant and dangerous drugs (the salts of copper, zinc, and iron), should be given directly after food, except when local conditions require their administration in very small doses on an empty stomach. *Morphin* by hypodermic injection should only be given when the patient is lying down, unless previously habituated to its use. *Pilocarpin*, administered to produce sweating, should be given when the patient is in bed in a warm room. *Ammonium acetate* acts as a diaphoretic when the recipient is warm in bed, but as a diuretic when the patient is in a cold atmosphere. *Sulphonal* should be given 2 or 3 hours before its hypnotic action is desired, as it is very slow of solubility and absorption (Potter).

Under some circumstances it becomes necessary to introduce medicines directly into the stomach, as in case of the patient's inability to swallow, through narcotic poisoning or other causes. The stomach-pump or the stomach-tube may then be employed to convey both food and medicine to that organ. In obstruction of the esophagus, as from stricture or malignant disease, it may become necessary to make an opening through the abdominal wall and the wall of the stomach itself. Nasal feeding, by the use of a soft catheter with a hard-rubber funnel inserted into its end, is a very efficient method of conveying liquids into the stomach. The eye end of the catheter is oiled and passed gently along the floor of the nose and down the pharynx, the fluid being then poured into the funnel. In many cases, especially insane ones, the patient will so constrict the muscles of the throat as to force the catheter into the mouth; but if it is withdrawn until nearly out of the pharynx, the presence of the fluid as it drops down will excite swallowing, and the patient may be fed as well as if the tube were in the esophagus. This method is particularly serviceable in cases of acute tonsillitis or other painful affections of the mouth and palate, also after excision of the tongue, when swallowing is to be avoided as much as possible. See GAVAGE.

The rectum will absorb many substances applied in the form of enemata or suppositories. Those most suited to this route are the salts of the alkaloids in solution, especially those of morphin, atropin, and strychnin, the latter being absorbed more rapidly by the rectum than by the stomach. Acid solutions, if not too frequently repeated, are well administered by this channel. Nutritive enemata must be small, not exceeding 3 or 4 fluidounces, or they will not be retained. They become necessary in many cases, especially in cases of gastric ulcer, in order to afford rest to the stomach. It is often found advantageous to have the food predigested before being administered by the rectum, for which purpose pancreatin is used. See SUPPOSITORY, ENEMA.

The respiratory tract admits of the rapid absorption of medicinal substances through its extensive blood-supply. The inhalation of vapors or atomized fluids, the insufflation of powders into the nares, fauces, larynx, etc., and the use of a medicated nasal douche, are methods whereby this channel may be utilized. See INHALANT, HYPODERMIC MEDICATION, INTRAVENOUS INJECTION, INUNCTION, etc.

MEDULLARY ANESTHESIA.—See INTRASPINAL ANESTHESIA.

MEGRIM.—See MIGRAINE.

MEL (Honey).—The substance deposited in the honeycomb by the common honey-bee, *Apis mellifica*, and a few other hymenopterous insects. It consists of a solution of cane-sugar and grape-sugar, with coloring and odorous matters. It is emollient, nutritive, and often laxative, its properties depending mainly on the character of the flowers from which it is taken. It is an excellent vehicle for expectorant gargles, etc. In pharmacy **mellita,** or **honeys,** are thick liquid preparations closely allied to syrups, but having honey as a base. There are three official honeys: **Mel. Mel Depuratum,** clarified honey, prepared by heating, skimming, and straining the natural product. **M. Rosæ**, honey of rose; fluidextract of rose 120, clarified honey to 1000. It is used locally as a gargle.

MELANCHOLIA.—A form of insanity characterized by depression of spirits and gloominess, without any adequate cause, the central idea being one of personal unworthiness. As the case develops, delusions, associated with illusions and hallucinations, appear, and the patient may at times show suicidal tendencies. The general nutrition suffers, and in females menstruation is usually suppressed. The usual age at which melancholia appears is during middle life. It follows any depressing cause, acting in conjunction with a strong hereditary tendency. It usually terminates in recovery, but some cases develop into dementia or mania, while others die from exhaustion or commit suicide.

Treatment.—It is generally useless to argue with a patient about the folly of his delusions or hallucinations. Removal of the condition of the brain upon which the morbid feeling depends is important. The first indication is to improve the general health and restore the exhausted nerve force by fresh air, good food, and tonics. Foreign travel is often highly efficacious, but a quiet rest at a health resort is as beneficial in most cases. Removal to an asylum is often productive of great benefit, the orderly, settled life and discipline being efficacious. Refusal to eat is often difficult to treat. It may be necessary to resort to forcible feeding 2 or 3 times daily with milk, meat-extracts, liquid custards, etc. Attention to the gastro-intestinal canal is of the greatest value, as the dyspepsia and constipation of melancholic patients are the greatest barriers to their recovery. Frequent bathing, with friction to the surface, aids in the eliminative action of the skin. Such tonics as quinin sulphate, arsenic, iron, and strychnin sulphate are all of value in building up the patient. As the strength improves, open-air exercise must be added to the other means used. Insomnia must be combated by evening bathing and feeding, and the use of trional, sulphonal, or hyoscin at bedtime. When stupor is present, the effect of the continuous electric current is often markedly beneficial.

MELANEMIA.—See BLOOD.

MELANODERMA or MELASMA.—See CHLOASMA, SUPRARENAL DISEASE.

MELENA OF THE NEW-BORN.—A greater or less amount of blood in the stools of children is not rare, and its presence may be due to blood having been swallowed with the milk, or from lesions in the nose, mouth, or throat. It may come from the large intestine, as in dysentery, when it is red and fluid, or from an ulcer of the stomach or small intestine, when it is black and tarry in appearance. True melena of the new-born, however, is a rare disease. It is more common in hospital cases than in private practice, occurs the first 2 weeks of life, usually the second or third day, is apparently self-limited, when recovery takes place, the course being 5 to 9 days, and after death no lesion may be found in the gastrointestinal tract to account for the hemorrhage. For these reasons it is thought to be of an infectious nature, but further than this the etiology is not known.

Symptoms.—When the hemorrhage is considerable, the child will become suddenly pale and present the symptoms of collapse. The bowel movements will consist of thick, dark blood, and may follow one another in rapid succession, the later ones consisting of bright blood. When the amount of blood lost is slight, it may be discovered only when the napkin is changed, and the little patient will retain a normal appearance. A rise in temperature (101° to 103° F.) during the attack has been noticed in all cases. The hemorrhage may recur for several days, and the child is worn out by the excessive loss of blood and becomes emaciated and dies, or, when recovery takes place, convalescence is likely to be long and troublesome. The mortality rate is given as 50 to 80 percent.

Treatment.—Food should be given cold. The infant must be kept absolutely at rest, and if the body and extremities are cold, hot-water bottles should be placed about it. Morphin in minute doses, 1/1000 to 1/500 of a grain hypodermically, or 1 drop of paregoric by the mouth, may be necessary to quiet the child. One-drop doses of spirits of turpentine suspended in mucilage, given every hour, seem to have a controlling influence on the hemorrhages.

In other cases 1-drop doses of chlorid of iron have given good results. Ergotin, in 1/2 grain doses by the mouth or hypodermically, should be tried.

MEMORY, LOSS.—See Amnesia.

MÉNIÈRE'S DISEASE.—The symptom complex known as Ménière's disease is probably the result of a morbid process in the labyrinth or auditory nerve endings. It is characterized by excessive vertigo, loud tinnitus aurium, nausea, vomiting, and other phenomena. The symptoms appear at first in distinct paroxysms, ushered in by a shrill ringing in one ear, followed by pronounced dizziness. Consciousness is impaired; the skin is pale and cool, and the face is bathed in cold perspiration. The first paroxysms are of brief duration, but they may persist for years until overcome, or deafness is complete on that side.

This affection is not to be confounded with epilepsy or apoplexy. The sudden onset of the paroxysm, and the complaint of vertigo, together with ear symptoms, lead to a certain diagnosis.

Treatment.—The following remedies have been used: Quinin, 5 to 10 grains; bromids, 30 grains; salicin or salicylates, 30 grains; digitalis, 10 minims of the tincture every 4 or 8 hours, along with counterirritation behind the mastoid, and by the continuous current. Pilocarpin, 1/8 grain or less, and ammonium bromid with ammonium chlorid, 15 grains of each, have given relief. Sometimes air charged with chloroform vapor, injected into the eustachian tube, dispels the discomfort.

MENINGITIS.—Inflammation of the membranes of the brain. The several varieties are considered below; and see Cerebrospinal Meningitis.

Pachymeningitis.

Inflammation of the dura; when the external layer is primarily involved, it is termed external pachymeningitis; when the internal layer is primarily involved, it is termed internal pachymeningitis.

Etiology.—External pachymeningitis is a surgical malady, induced by fractures, penetrating wounds, and other injuries of the skull. Internal pachymeningitis is due to blows upon the head without injury to the skull. A predisposition may be created by chronic alcoholism, scurvy, nephritis, and syphilis. Chronic internal otitis and suppurative inflammation of the orbit, and inflammation in the venous sinuses, the result of a thrombus undergoing suppurative changes, may be causes.

The symptoms are very obscure, and are principally those of cerebral pressure. Persistent headache, vertigo, photophobia, anorexia, insomnia, gradual impairment of intellect and locomotion, followed by delirium and convulsions and coma, or by apoplectic attacks and paralysis, are suggestive signs in the aged, or those in whom some one of the causes of pachymeningitis is present. Circumscribed painful edema behind the ear and less fulness of the jugular of the corresponding side are indicative of thrombosis in the transverse sinus.

Diagnosis is always problematic, as the symptoms are masked.

Prognosis is most unfavorable for either form, although the course of the malady is usually slow. Surgical treatment in traumatic cases offers some hope.

Treatment.—External pachymeningitis should be treated surgically. Trephining is indicated in some cases. It is claimed that benefit has followed a thorough course of potassium iodid. In the great majority of cases, however, all that can be done is to treat the distressing symptoms. See Brain (Inflammation).

Simple Acute Meningitis.

Under simple acute meningitis are classed those cases of inflammation of the pia not due to a specific organism, such as the tubercle bacillus. The affection is most common in children.

Etiology.—Meningitis may follow traumatism of the skull and sunstroke. It also occurs secondary to the infectious diseases, such as pneumonia, scarlet fever, variola, influenza, acute nephritis, or rheumatism, and may result from purulent otitis media, caries of the small bones of the skull, or erysipelas of the head. Some cases are idiopathic, the cause not being apparent.

Pathology.—The cerebrospinal fluid is increased in quantity, and there is an inflammatory condition of the pia, also of the dura and the gray matter of the brain. When the disease continues for a considerable length of time the membranes become thickened, and the pia becomes adherent to the cortical substances. The inflammation may be nonpurulent, but in severe cases pus is found in the pia, the subarachnoid spaces, and over the convolutions of the brain. When recovery takes place the exudate is absorbed, but the membranes may remain thickened and adherent.

Symptoms.—The disease usually comes on gradually, and is indicated by a feeling of malaise, headache, nausea, and vomiting, which symptoms may continue for several days. The vomiting occurs independently of taking food, and, although it is so persistent, it may be associated with a clean tongue. The bowels are, as a rule, constipated. The patient becomes listless, apathetic, and drowsy, and may have a convulsion. Later, there are restlessness, delirium, and, finally, coma; the back of the neck is stiff, and there may be opisthotonos, repeated convulsions, or paralysis. The eyes are set, and optic neuritis may give rise to blindness. There is loss of control of the bladder and rectum. The temperature varies from 101° to 104° F., but there may be hyperpyrexia (106° or 107° F.). The pulse, which at first is very rapid, becomes irregular and slow. In unfavorable cases the symptoms all increase in severity; the coma is deepened, and the respiration becomes of the Cheyne-Stokes character, ending in death. On the other hand, when recovery is to take place, the symptoms remain stationary for a time after the comatose stage is reached, then gradually abate, and consciousness and improvement slowly follow.

The course of the attack is from 4 to 12 weeks.

The prognosis is always grave, and when recovery occurs, there are frequently left traces of the disease, such as blindness, paralysis, speech-defects, or a defective intellect.

Diagnosis.—It is important not to confound true meningitis with the **pseudomeningitis,** which is a purely nervous or toxic condition, occurring with digestive disturbances or with the infectious diseases, as influenza, pneumonia, or the exanthems, and which in children so frequently give rise to grave cerebral symptoms.

Tubercular meningitis is differentiated by the fact that in this affection there are usually prodromes, intermissions in the temperature, an irregular course, perhaps a longer duration, and a greater tendency to coma. The family history and diathesis of the child will give valuable information. An error is easily made, however, in these cases, and the prognosis must therefore be guarded.

In **cerebrospinal meningitis** the onset is more sudden, the course shorter, there may be an eruption on the skin, and it usually occurs in more or less wide-spread epidemics. See CEREBROSPINAL MENINGITIS.

When the diagnosis is at all doubtful, lumbar puncture should be resorted to.

Treatment.—The patient should be kept in a darkened, absolutely quiet room, attended by a careful and intelligent nurse, and given at first a purgative dose (1 to 5 grains, repeated if necessary) of calomel, continuing with smaller doses (1/10 to 1/2 grain) every 3 or 4 hours. Since urotropin seems to have an antiseptic action on the cerebrospinal fluid, its administration is advocated in beginning meningitis or when meningeal infection is feared as a complication. To protect against the action of the mercurial, the mouth should be frequently washed with a solution (5 to 10 grains to the ounce) of chlorate of potassium. The hair should be cut short, and an ice-bag kept applied to the head. For the restlessness and wakefulness, a warm bath or sponging with warm water will often have a quieting effect but if not, chloral and the bromids, sulphonal, or trional must be used. Large doses of the bromids (10 to 15 grains every 2 hours for a child 2 years old) may be necessary before the desired result will be secured.

The following formula will be found a convenient combination:

℞. Chloral hydrate, ʒ ss
Sodium bromid, } each, ʒ ij
Sodium iodid, }
Water, ℥ iv.

One teaspoonful in water every 3 hours to a child 3 or 4 years old.

If the treatment outlined above does not lessen the severity of the symptoms, alternate lukewarm and cold douching of the neck and upper part of the spine should be practised 3 times a day, and inunctions of mercury thoroughly applied twice a day. For the relief of severe pain, it may be necessary to give morphin (1/24 to 1/4 of a grain) hypodermically. When the pulse is rapid, irregular, or weak, alcohol in some form and digitalis are called for. Retention of urine may occur, when it will be necessary to use the catheter; and when there is refusal or inability to take food, the patient must be fed by gavage or by the rectum. For the paralysis which may remain after the attack, massage, warm baths, and friction should be employed, but electricity only after all symptoms of central irritation have subsided. Iodid of potassium should be given for a long period when the symptoms persist, as it aids the absorption of inflammatory products. Lumbar punctures have proved beneficial.

Tuberculous Meningitis.

Synonyms.—Tuberculous leptomeningitis; basilar meningitis; acute hydrocephalus, water on the brain.

An inflammation of the soft intracranial membranes, more particularly the basal pia mater, attended with or due to the deposit of gray miliary tubercles; characterized by gradual decline of the bodily and mental powers.

Etiology.—It is usually a secondary affection, a sequel to tuberculous disease of some other organ. It occurs most frequently in children between 2 and 6 years of age, although numerous cases are reported between the ages of 20 and 30. The so-called scrofulous children possess a special susceptibility to tubercular meningitis.

Pathologic Anatomy.—The deposition of tubercle usually occurs at the base of the brain. Depositions of grayish-white granules, of a translucent, somewhat gelatinous appearance—miliary tubercle—are distributed along the vessels of the pia mater, resulting in inflammation and the exudation of lymph, with the consequent thickening and opacity of the membranes. The cerebral tissue is not usually involved, although on section the lines indicative of blood-vessels are very much increased in number. The ventricles are distended by a clear or milky, or even bloody, serum. Tubercular deposits occur in the lungs, intestines, and, at times, in other organs. The presence of the tubercles alone may give rise to no symptoms until the exudative products of the resultant inflammation develop.

Symptoms.—The advent is either gradual and insidious, or with convulsions, in which case the after-progress is rapid.

Prodromes.—The child grows irritable, with loss of appetite, loss of flesh, swollen abdomen, constipation alternating with diarrhea, irregular attacks of feverishness, grinding the teeth during sleep, or insomnia. The child exhibits symptoms of headache. The duration of this stage is from 1 week to a month or two.

Stage of Excitation.—The onset is somewhat sudden, with obstinate vomiting, severe headache, convulsions, fever, 102° to 103° F. in the evening, falling to 99° F. in the morning, pulse soft and compressible, with irregular rhythm. On drawing the finger-nail lightly over the surface, a red line results. The symptoms grow progressively worse with exaltation of the special and general senses, the least pinch or even touch causing exquisite pain; there are spasmodic movements of the muscles with contraction and rigidity, and at times even opisthotonos. The duration of this stage is about 2 weeks.

Stage of Depression.—The symptoms of this stage are the result of the pressure of the exudation. The pulse is slow and compressible, with irregular rhythm; the temperature is depressed; there is a tendency to somnolence alternating with quiet delirium, mental stupor, and continual movement of the fingers, as in picking up objects. From time to time convulsions appear with strabismus, oscillation of the eyeballs, followed by intervals of wakefulness, when the headache is excruciating, causing the peculiar, shrill shriek—"the hydrocephalic cry," associated with contraction of the muscles of the face, as if suffering were experienced. Finally collapse occurs, with the Cheyne-Stokes respiration, the coma deepening, followed by death, convulsions often ending the scene. The duration of this stage is from 1 day to 2 weeks.

Diagnosis.—Simple acute meningitis and tubercular meningitis have closely analogous symptoms during the stage of excitation, but the history and clinical course of the two maladies determine the diagnosis.

Prognosis is unfavorable. The usual duration is 3 or 4 weeks after fully developed prodromes. If ushered in by convulsions, the duration is shorter.

Treatment is unsatisfactory. There are no means of retarding the disease. The symptoms should be treated as they develop. Blisters, leeches, active purgation, pustulating ointments, potassium iodid, and mercury are all useless. Lumbar puncture has been praised highly by some.

If the hereditary tendency is marked, nutritious food, cod-liver oil, iron iodid, and quinin may be used in prophylaxis and treatment. See TUBERCULOSIS.

MENINGOCELE.—A meningocele is a congenital hernia protruding through an opening of the skull. When, in addition to the meninges, the brain-substance protrudes, it is termed **encephalocele,** and when this mass also contains liquid, **hydrencephalocele.**

The most frequent site of these tumors is at the occiput, when the protrusion occurs from an opening through or at the edge of the occipital bone; the next most common location is the nasofrontal region; they are rarely seen on other portions of the skull.

Symptoms.—The tumor varies in size from a mere nodule to a size as large or larger than the rest of the child's head, and whatever the exact character of its contents, it can be more or less reduced by compression, but such compression usually produces cerebral symptoms, such as stupor or fretfulness, vomiting, and strabismus. The skin covering the tumor may be tense and covered with a scant growth of hair, or red and vascular.

Diagnosis.—An encephalocele pulsates, and, when the child cries, becomes tense; it is usually opaque, and indistinct fluctuation may be felt. A true meningocele is always small, and, as a rule, pedunculated; its contents admit of complete reduction, and it is translucent.

Prognosis.—The occipital tumors are usually more serious than the frontal ones. In the majority of cases death occurs during the first few weeks of life, the result of meningitis, convulsions, or rupture, and when death does not take place, most of the patients exhibit signs of mental impairment or other evidences of organic brain-disease.

Treatment.—The growth should be carefully protected from injury, operation being justifiable only in case of impending rupture. Repeated tappings and injection of Morton's fluid (iodin, 10 grains; iodid of potassium, 30 grains; glycerin, 1 ounce) have succeeded in cases of meningocele in reducing the tumor, but unless it is pedunculated and very small, the probability of a good result is very remote. See SPINA BIFIDA.

MENINGOCOCCUS SERUM.—See CEREBROSPINAL MENINGITIS.

MENINGOMYELOCELE.—See SPINA BIFIDA.

MENOPAUSE.—The period at which menstrual activity ceases. This usually occurs beween the fortieth and fiftieth years.

The final cessation of menstruation may occur in one of several ways: it may cease abruptly, there may be a gradual diminution in the amount of blood lost at each successive period until it finally ceases entirely, or there may be a gradually lengthening interval between the periods. Besides the cessation of menstruation there are other phenomena, such as disturbances of digestion, flushes of heat, and nervous derangements. These disturbances may be entirely absent or they may last for a period varying from a few months to 2 years. Associate symptoms of beginning presbyopia must not be overlooked. Return of bleeding after it has once ceased, or profuse bleeding at the time of the menopause, should always arouse suspicion in the mind of the physician. It is frequently caused by malignant disease of the uterus, fibroid tumors or fungous endometritis.

The treatment of the menopause consists in attention to the general health and regulation of the bowels and diet. Plenty of fresh air and a proper amount of exercise will be found beneficial. For the nervous symptoms, change of surroundings and nerve sedatives are indicated. Saline purgatives are especially beneficial. The influence of beginning presbyopia in causing headaches should be considered, and reading glasses ordered. The other reflex phenomena are best treated with potassium bromid, which drug also diminishes the amount of blood determined to the sexual organs. Occasional bleeding or cupping gives relief. Diet should be plain and unstimulating, beer and spirits prohibited, and light wines allowed. Tepid baths are useful. Late hours are to be avoided. Abstracting blood from the uterus generally does harm, but leeches to the anus are sometimes beneficial.

MENORRHAGIA AND METRORRHAGIA.—By the first term is meant profuse or excessive bleeding at the menstrual periods. By the second is meant bleeding between the menstrual periods.

Menorrhagia is a relative term, since the duration of the menstrual period and the amount of blood lost at each period vary so widely in different women. To judge of this condition, therefore, in any particular case the present menstrual condition must be compared with the previous menstrual history.

The causes, pathology, and treatment of the foregoing conditions are practically the same.

The most important **causes** are endometritis, subinvolution and displacements of the uterus, lacerations of the cervix, fibroid tumors, and tubal and ovarian disease. Endometritis is present in the great majority of instances, either alone or associated with one of the above conditions. After the age of 30, cancer of the cervix or of the body of the uterus should always be suspected.

The treatment will depend upon the cause. Cancer and fibroid tumors usually require hysterectomy. Lacerations of the cervix should be repaired, and displacements should be corrected by pessary or operation. Salpingo-oöphorectomy will be necessary in the majoritv of cases due to chronic disease of the tubes and ovaries.

Thorough curettage will relieve, temporarily at least, a large proportion of cases. Rest in bed, copious vaginal douches of hot water, glycerin tampons, and moderate purgation are all beneficial. Hydrastis, viburnum, and ergot are the drugs which have given the best results in the above cases. Thyroid extract has been used with success. The following formula will be found useful:

℞. Fluidextract of ergot, ʒ ij
Fluidextract of hydrastis, } each, ʒ j.
Fluidextract of viburnum, }
One teaspoonful in water 3 times a day.

MENSTRUATION.—A periodic discharge of a sanguineous fluid from the uterus and fallopian tubes, occurring during the period of a woman's sexual activity, from puberty to the menopause. It is suspended during pregnancy and early lactation. The flow is alkaline and composed of blood, shreds of mucous membrane, and vaginal and uterine secretion; it is darker than ordinary blood, and should not clot; its odor is characteristic and disagreeable; the usual quantity is from 4 to 6, ounces.

For discussion of the **anomalies of menstruation,** see AMENORRHEA, DYSMENORRHEA, MENOPAUSE, MENORRHAGIA AND METRORRHAGIA, PREGNANCY, etc.

MENTHA PIPERITA (Peppermint).—The dried leaves and flowering tops of *M. piperita*, or common peppermint, having properties due to a volatile oil, in which form it is commonly used. It is an aromatic stimulant, carminative, and antispasmodic, and is valuable internally to relieve flatulent colic, and externally to relieve superficial neuralgia.

M. Pip., Aqua, contains 2 parts of the oil in 1000 of distilled water. Dose, 2 to 6 drams. **M. Pip., Ol.,** the volatile oil. Dose, 1 to 5 minims. **M. Pip., Spt.,** essence of peppermint, contains 10 percent of the oil and 1 percent of the herb in alcohol. Dose, 10 to 45 minims.

MENTHA VIRIDIS (Spearmint).—The dried leaves and flowering tops of *M. spicata*, the "mint" of the kitchen garden. Its constituents and properties are identical with those of peppermint, but its odor and taste differ therefrom. Spearmint corresponds in action to peppermint, but is less powerful. It is employed to correct flatulence and to relieve colic, and makes an agreeable flavoring for mixtures.

Oleum M. V. is the volatile oil distilled from the plant. Dose, 2 to 5 minims. **Aqua M. V.** has 2 parts of the oil in 1000 of distilled water. Dose, 2 to 6 drams. **Spiritus M.V.,** *essence of spearmint*, is an alcoholic solution containing 10 percent of the oil and 1 percent of the bruised herb. Dose, 10 to 45 minims.

MENTHOL.—$C_{10}H_{19}OH$. A secondary alcohol, obtained from oil of peppermint, from which it separates in crystalline form on cooling. Slightly soluble in water, freely so in alcohol, ether or chloroform. Dose, 1/2 to 3 grains, in a pill or spirituous solution several times a day.

Therapeutics.—Menthol is highly praised as an external application in various neuralgias, sciatica, pleurodynia, and toothache. For neuralgia it is used in saturated alcoholic solution painted over the affected nerve. For toothache a crystal introduced into the carious cavity is promptly anodyne. In spray containing 5 to 20 percent it is highly efficient in epidemic influenza and in tuberculous laryngitis. It is a good application in parasitic skin diseases, and has marked value as an antipruritic. Its vapor by inhalation is efficient against cough, and it has considerable power as an anti-emetic, having stopped nausea and vomiting after the usual remedies had failed. For this purpose ten drops of a 20 percent solution in olive oil are given on sugar.

The drug has been used in the vomiting of pregnancy, in hourly doses of a teaspoonful of the following:

℞. Menthol,	gr. xv
Whisky,	ʒ vj
Syrup,	℥ j.

It is also used as a carminative and in gastralgia, in the dose of 1 to 2 grains 3 times daily in pill or solution.

MERCUROL.—A compound of mercury with yeast nuclein. It contains about 10 percent of mercury. It is used extensively as an injection in 1 percent solution, in gonorrhea and cystitis. Dose, 1/2 to 3 grains, three times a day.

MERCURY (Hydrargyrum; Quicksilver).—Hg = 200; quantivalence II, IV. The only liquid metallic element, hence the common name, *quicksilver*. In medicine the metal, its nitrate, oxids, chlorids, and iodids are the salts most commonly, the sulphid less frequently, used.

Therapeutics.—In small doses, continued not too long a time, it is a tonic, purgative, and alterative. In larger doses, or too long continued, it is likely to produce a condition called hydrargyrism, salivation, or ptyalism. In "biliousness" mercurial purgatives have long been a favorite remedy, blue mass and mercurous chlorid or calomel being usually employed. In syphilis mercuric chlorid and mercuric iodid are generally considered specific. Mercury in the form of calomel is useful in glandular inflammations, and locally in corneal inflammations. Formerly calomel was much used in typhoid fever and malarial fevers. The soluble salts of mercury are highly poisonous.

The metal itself is inert, but by combination with the acids and fluids of the body becomes active, and is easily absorbed in any form. In the blood its effects, in small doses, are tonic, but in quantity it indirectly produces impoverishment thereof. From the blood it enters the tissues, where it remains for an indefinite period, exerting a peculiar influence, termed alterative, on all processes characterized by growth of young cells. It stimulates most of the glands of the body to the production of pathologic secretions, especially the salivary glands and the pancreas. It tends to accumulate in the liver, stimulating the flow of bile. Its excretion is hastend and completed by the use of potassium iodid. In small doses administered for a short time the mercurial preparations are blood-tonics.

A purgative and cholagog pill:

℞. Extract of colocynth,	ʒ ss
Powdered scammony,	gr. xx
Calomel,	gr. xij.

Make into 12 pills; take 1 at night, as necessary.

In chorioretinitis:

℞. Mercuric chlorid,	gr. iij
Extract of belladonna,	gr. vj.

Make 60 pills; give 1 pill after each meal.

In ozena:

℞. Ammoniated mercury,	gr. iv
Pulverized white sugar,	℥ ss.

Use as a snuff, after blowing the nose.

In eczema (calomel ointment):

℞. Calomel,	each, gr. xl
Magnesium carbonate,	
Cold cream,	℥ j.

Use in eczema.

In dropsy of chronic heart- and liver-disease:

℞. Mass of mercury,	each, gr. xx.
Powdered squill,	
Powdered digitalis,	

Mix and make into 20 pills; give 1 pill thrice daily.

In late syphilis:

℞. Mercuric chlorid,	gr. j to jss
Potassium iodid,	ʒ jss to iv
Compound syrup of sarsaparilla,	℥ j
Water, enough to make	℥ ij.

Give 1 teaspoonful 3 times daily.

In syphilis:

℞. Mercury biniodid,	gr. j
Potassium iodid,	ʒ ij
Peppermint water, q. s.	℥ iij.

Give 1 teaspoonful after each meal.

In late syphilis, for hypodermic use:

℞. Mercuric chlorid,	gr. vj
Sodium chlorid,	gr. xxxvj
Distilled water,	ʒ iijss.

Inject 5 to 8 drops daily, hypodermically.

In syphilis:

℞. Mercuric chlorid,	gr. iv
Purified opium,	gr. viij
Extract of guaiac,	ʒ ss.

Mix and make into 24 pills; one 3 times a day with a compound decoction of sarsaparilla.

In syphilis:

℞. Bichlorid of mercury,	gr. j
Tincture of rhubarb,	each, ℥ j.
Tincture of cinchona,	

Mix and give 1 teaspoonful twice a day

In constipation:

℞.	Mercuric chlorid, Strychnin sulphate,	each, gr. ss
	Quinin sulphate,	gr. xij
	Extract of belladonna,	gr. ij.

Mix and make into 12 pills; take 1 night and morning.

Yellow wash:

℞.	Bichlorid of mercury,	gr. xv
	Lime-water,	O ij.

Mix and make into a lotion; apply to syphilitic sores.

Poisoning.—The first symptoms of **salivation** are fetid breath, swollen and spongy gums, having a bluish line along their margins, stomatitis, sore and loosened teeth, inflamed and tender salivary glands pouring out a peculiar, thin saliva of foul odor in large quantity, and a metallic taste in the mouth. Emaciation, pallor, edema, ulcerated skin, erythematous, vesicular, or pustular eruptions, headache, insomnia, neuralgia, tremor through paresis of the muscles of the head and extremities, epilepsy, coma, and convulsions may ensue. An influenzal condition is not uncommon.

Salivation is most readily produced by blue mass, next by calomel, and less easily by gray powder. Children are not easily salivated. Inhalation of mercurial vapors is likely to affect the nervous system most; its internal administration and that by inunction are more likely to produce salivation. Treatment consists in the withdrawal of the mercury, antiseptic mouth-washes, particularly the potassium chlorate, and, later, the use of the iodids as eliminatives.

Poisoning by the bichlorid requires the prompt oral administration of large amounts of albumin, the whites of eggs being most easily obtained. The stomach should be washed out, external heat applied about the body, and stimulants to the respiration and circulation given. If death does not ensue at once, the organic changes in the gastrointestinal tract, such as strictures, sloughs, and destruction of the peptic glands and ulceration, generally cause a protracted convalescence, or may eventually result in a fatal issue.

Preparations.—**H. Ammoniatum,** ammoniated mercury, "white precipitate," mercuric ammonium chlorid, NH_2HgCl, is used externally. **H. Ammoniati, Ung.,** "white precipitate ointment"—ammoniated mercury 10, white petrolatum 50, hydrous wool fat 40. **H. Chloridum Corrosivum,** $HgCl_2$ (**H. Perchloridum,** B. P.), corrosive chlorid of mercury, mercuric chlorid, "bichlorid of mercury," "corrosive sublimate." Soluble in water and alcohol; antisyphilitic. Dose, 1/80 to 1/10 grain. Very poisonous. **H. Chloridum Mite,** Hg_2Cl_2 (**H. Subchloridum,** B. P.), mild chlorid or subchlorid of mercury, mercurous chlorid, "calomel"—laxative, tonic, and antipyretic. Insoluble in water and alcohol. Dose, 1/20 to 5 grains. **H. cum Creta,** mercury with chalk, "chalk-mixture," "gray powder," contains mercury 38, clarified honey 10, prepared chalk 57, water sufficient quantity. Dose, 1/2 to 10 grains. **H., Emplastrum,** mercurial plaster—mercury 30, oleate of mercury 1, hydrous wool fat 10, lead plaster 59. **H., Arsenii et Iod., Liq.,** Donovan's solution. See ARSENIC. **H. Flav., Lotio,** unof., "yellow wash" for syphilitic sores—corrosive sublimate 18 grains, lime-water 10 ounces. **H. Iodid. Flavum,** HgI, yellow iodid of mercury, mercurous iodid, protiodid. Dose 1/10 to 1/3 grain. **H. Iodid. Rubrum,** HgI_2, red iodid or biniodid of mercury, mercuric iodid. Soluble in a solution of potassium iodid. Poisonous. Dose, 1/50 to 1/10 grain. **H., Massa,** "blue mass," "blue pill," has mercury 33, licorice 10, althæa 15, glycerin 9, honey of rose 33. It is used mainly as a purgative. Dose, 1/2 to 10 grains. **H. Nigra, Lotio,** unof., "black wash" for syphilitic sores—calomel 30 grains, lime-water 10 ounces. **H. Nitrat., Liq.,** solution (60 percent) of mercuric nitrate. It is used as an escharotic. **H. Nitrat., Ung.,** citrine ointment—mercury 7, nitric acid 17, lard oil 76. **H., Oleat.,** contains yellow oxid 25, distilled water 25, oleic acid to 100. **H. Oxid. Flav.,** yellow oxid of mercury. Insoluble in water; soluble in nitric and hydrochloric acids. It is used in the preparation of ointments, etc. **H. Oxid. Flav., Ung.,** contains 10 percent of the oxid. **H. Oxid. Rub.,** red oxid of mercury. Dose, 1/50 to 1/10 of a grain. **H. Oxid. Rub., Ung.,** contains 10 percent of the oxid. **H. Oxycyanid.** It is said to be less irritating than mercuric chlorid. It has greater antiseptic power than the latter, it is said; and it does not corrode steel instruments. Dose, hypodermically, is the same as the chlorid; it is used locally in 1:5000 solution. **H. Subsulph. Flav.,** yellow subsulphate of mercury, basic mercuric sulphate, "turpeth mineral." Soluble in nitrohydrochloric acid. Dose, for emesis, 2 to 5 grains. **H., Unguent.,** mercurial ointment—mercury 50, lard 25, suet 23 oleate of mercury 2. These are triturated until the globules of mercury disappear under a magnifying glass. It is used to produce the physiologic effects of mercury by inunction. **H. Ung., Dil.,** *Blue ointment* has of the preceding 67, and petrolatum 33, well mixed. **Gray Oil,** *Oleum cinereum,* a semifluid, fatty, mercurial liquid introduced into medicine by Lang, of Vienna, in 1886. It is used in the treatment of syphilis by injections. It is prepared as follows: A given quantity of lanolin—1 or 2 drams—is rubbed up with sufficient chloroform to emulsify it. This mixture is to be thoroughly triturated, during which operation the chloroform will evaporate. While the mixture is still in a fluid state metallic mercury to the amount of double the quantity of the lanolin is to be added, the trituration being meanwhile continued. As a result, a pomade of mercury is left, which represents 2 parts of mercury and 1 part of lanolin. This is called strong gray lanolin ointment. From this salve-basis a 50 percent oleum cinereum, or *gray oil,* may be obtained by mixing 3 parts with 1 part of olive oil. A mild gray lanolin ointment may be made in the same manner as the strong, by taking equal parts of lanolin and mercury and thoroughly mixing them. From this salve-basis a 30 percent gray oil may be made by mixing 6 parts with 4 parts of fresh almond oil or olive oil.

MERYCISM.—See Rumination.

MESENTERIC GLANDS.—See Tabes Mesenterica.

MESMERISM.—See Hypnotism.

MESOTAN.—Ericin. The methyl-oxymethyl-ester of salicylic acid. A yellow fluid, containing 71 percent of salicylic acid, is readily absorbed by the skin, and, mixed with an equal quantity of olive oil, is used with friction as an external remedy in rheumatism.

METATARSALGIA (Morton's Disease).—It is characterized by severe neuralgic pain beginning at the side of the distal end of the third or fourth metatarsal bone and extending up into the foot and leg. It is the result of tight shoes. Treatment consists in wearing a flat-foot brace if necessary and properly fitting shoes, or, in extreme cases in resection of the head of the bone or excision of the superficial branch of the external plantar nerve.

METEORISM.—See Tympanites.

METHYL.—In chemistry a radical molecule of the composition of CH_3. It is the base of a large number of compounds, including alcohol, methyl spirit, and several ptomains.

Methyl acetanilid. See Exalgin.

Methyl chlorid is a colorless gas with an odor resembling ether or chloroform, and used to produce local anesthesia. It is applied to the skin in a spray or by means of a cotton tampon. The spray should not continue longer than from 2 to 4 minutes. Its advantages over an ether spray are its noninflammability and its more rapid effect. Methyl chlorid is employed in minor surgical cases, such as opening boils and removing small growths, in pruritus, in neuralgias, and to allay spinal irritation.

Methyl salicylate is the active principle of wintergreen, of which the oil contains about 90 percent. It has the same properties as the oil of gaultheria, and may be used for the same purposes. It is also used to disguise the taste of unpalatable drugs, and as a substitute for the salicylates in rheumatism. It is valuable as an external application in arthralgias. A liniment is prepared as follows:

℞. Ether,
Alcohol, } each, ʒ j
Methyl salicylate,
Soap liniment, enough for O j.
Use as a liniment.

Methyl-violet, or **pyoktanin,** is an anilin dye appearing in the form of a blue, odorless powder, soluble in 75 parts of water. It is a moderately efficient antiseptic, and is not coagulated by albumin, and stains the tissues blue. In solutions of 1:2000 or 1:1000 it has been used in ulcerative keratitis, purulent ophthalmia, and in iritis. The same strength solutions have been used in empyema to flush out the pleural sac, and it has been employed in diphtheria and forms of infectious laryngitis. In circumscribed sarcoma and carcinoma deep injections of methyl-violet have been used.

METHYLENE.—CH_2. A bivalent hydrocarbon radicle occurring in many compounds.

Methylene-blue, methylthionin hydrochlorid, is a coal-tar dye prepared from dimethyl anilin; it is much used in the arts and as a stain in bacteriology. Its 10 percent solution is recommended as a local application in diphtheria, tonsillitis, scarlatinal sore throat, and other inflammatory conditions, and internally administered it has proved serviceable as an antiperiodic and antalgesic. Dose, 1 to 6 grains in capsule; 2 grains of powdered nutmeg should be given with each dose, to prevent strangury.

Methylene bichlorid, CH_2Cl_2, is a general anesthetic. It is asserted by Genther and Eichholz to be more susceptible of management than chloroform in protracted operations. Much of the methylene bichlorid contains 50 to 75 percent of chloroform. Unof.

METRIC SYSTEM.—A decimal system of weights and measures employed in France, Germany, and other countries, and used generally in the sciences. The standard is the *meter*, the 1/10,000,000 part of a quadrant of a meridian circle of the earth. The standard of capacity is the *liter*, a cubic volume 1/10 of a meter in each dimension. The standard of weight is the *gram*, the weight of 1/1000 of a liter (1 cubic centimeter) of distilled water at its maximum density. The unit of superficial measure is the *are*, a square whose side is 10 meters, or a decameter. As the unit of microscopic measurement, the thousandth part of a millimeter has been adopted. It is called micron or microm, micromillimeter; represented by the sign μ. The multiples are expressed by the prefixes *deca*, *hecto*, and *kilo;* the subdivisions by the prefixes *deci*, *centi*, and *milli*.

1000 meters = 1 kilometer.
100 meters = 1 hectometer.
10 meters = 1 decameter.
.1 meter = 1 decimeter.
.01 meter = 1 centimeter.
.001 meter = 1 millimeter.

1000 liters = 1 kiloliter.
100 liters = 1 hectoliter.
10 liters = 1 decaliter.
.1 liter = 1 deciliter.
.01 liter = 1 centiliter.
.001 liter = 1 milliliter.

1000 grams = 1 kilogram.
100 grams = 1 hectogram.
10 grams = 1 decagram.
.1 gram = 1 decigram.
.01 gram = 1 centigram.
.001 gram = 1 milligram.

In common practice, however, the following divisions only are used, the others being expressed in figures:

10 millimeters = 1 centimeter.
100 centimeters = 1 meter.
1000 meters = 1 kilometer.
1000 cubic centimeters = 1 liter.
1000 milligrams = 1 gram.
1000 grams = 1 kilogram

The following are the equivalent values:

1 meter = 39.37 inches.
1 liter = 1 quart ½ gill, U. S measure.
1 gram = 15.43 grains.
1 minim = 0.061 cubic centimeter.

See also Weights and Measures.

The following **metric conversion table** has been compiled by Mr. C. W. Hunt, of New York:

Millimeters multiplied by .03937 equals inches.
Millimeters divided by 25.4 equals inches.
Centimeters multiplied by .3937 equals inches.
Centimeters divided by 2.54 equals inches.
Meters equals 39.37 inches. (Acts of Congress.)
Meters multiplied by 3.281 equals feet.
Meters multiplied by 1.094 equals yards.
Kilometers multiplied by .621 equals miles.
Kilometers divided by 1.0093 equals miles.
Kilometers multiplied by 3280.7 equals feet.
Square millimeters multiplied by 0.155 equals square inches
Square millimeters divided by 645.1 equals square inches.
Square centimeters multiplied by .155 equals square inches.
Square centimeters divided by 6.451 equals square inches.
Square meters multiplied by 10.764 equals square feet.
Square kilometers multiplied by 247.1 equals acres.
Hectares multiplied by 2.471 equals acres.
Cubic centimeters divided by 16.383 equals cubic inches.
Cubic centimeters divided by 3.69 equals fluidrams (U. S. P.).
Cubic centimeters divided by 29.57 equals fluidounces (U. S. P.).
Cubic meters multiplied by 35.315 equals cubic feet.
Cubic meters multiplied by 1.308 equals cubic yards.
Cubic meters multiplied by 264.2 equals gallons (231 cubic inches).
Liters multiplied by 62.022 equals cubic inches. (Act of Congress.)
Liters multiplied by 33.84 equals fluidounces (U. S. P.).
Liters multiplied by .2642 equals gallons (231 cubic inches).
Liters divided by 28.316 equals cubic feet.
Hectoliters multiplied by 3.531 equals cubic feet.
Hectoliters multiplied by 2.84 equals bushels (2150.42 cubic inches).
Hectoliters multiplied by .131 equals cubic yards.
Hectoliters divided by 20.42 equals gallons (231 cubic inches)
Grams multiplied by 15.432 equals grains. (Act of Congress.)
Grams multiplied by 981 equals dynes.
Grams (water) divided by 29.57 equals fluidounces.
Grams divided by 28.35 equals ounces avoirdupois.
Grams per cubic centimeter divided by 27.7 equals pounds per cubic inch.
Joule multiplied by .7373 equals foot-pounds.
Kilograms multiplied by 2.2046 equals pounds.
Kilograms multiplied by 35.3 equals ounces avoirdupois.
Kilograms divided by 1102.3 equals tons (2000 pounds).
Kilograms per square centimeter multiplied by 14.223 equals pounds per square inch.
Kilogrammeters multiplied by 7.233 equals foot-pounds.
Kilograms per meter multiplied by .672 equals pounds per square foot.
Kilograms per cubic meter multiplied by 0.26 equals pounds per cubic foot.
Kilograms per cheval vapeur multiplied by 2.235 equals pounds per horse-power.
Kilowatts multiplied by 1.34 equals horse-power.
Watts divided by 746 equals horse-power.
Watts divided by .7373 equals foot-pounds per second.
Calory multiplied by 3.968 equals B. T. U.
Cheval vapeur multiplied by .9863 equals horse-power.
Centigrade multiplied by 1.8 + 32, equals degrees Fahrenheit.
Francs multiplied by .193 equals dollars.

METRITIS.—See Uterus (Inflammation).

METRORRHAGIA.—See Menorrhagia.

MEZEREUM (Mezereon).—The bark of *Daphne Mezereum,* containing an inert, fixed oil, an inactive glucosid, *daphnin,* and an acrid *resin,* which is the anhydrid of a resinous acid named *mezereinic acid.* Mezereum is an ingredient of the compound fluidextract of sarsaparilla. Dose, 1 to 10 grains. **Fluidextractum mezerei,** is too acrid for internal use. Mezereum is a sialogogue, and an intensely acrid, irritant poison, producing violent vomiting, purging, nephritis and gastroenteritis. In small doses it is laxative and diuretic, and has had considerable reputation as an alterative. Externally the recent bark is a powerful local irritant, speedily producing vesication. Mezereum is rarely used internally by itself, but is employed in mixtures with sarsaparilla, etc., as an alterative in syphilis, rheumatism and some skin diseases of chronic type, but with doubtful efficacy. It has been used with good effect in toothache and as a masticatory in paralysis of the tongue. Its principal use is as a local irritant to keep up the discharge from issues or blisters, and to stimulate indolent ulcers.

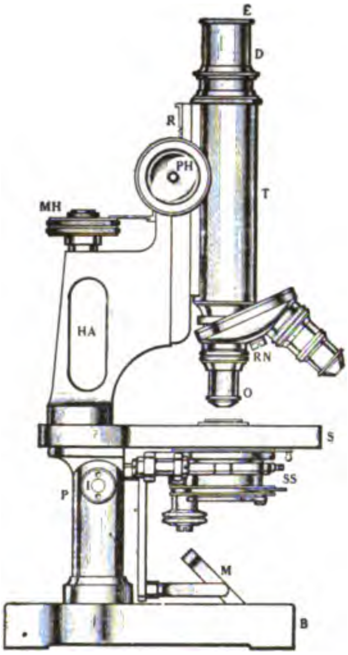
MICROCEPHALUS.—A condition in which a child is born with the skull completely ossified, or one in which ossification has taken place soon after birth.

The operation for the relief of microcephalus is known as **linear craniotomy**; it is performed by making a longitudinal incision through the skin to one side of the sagittal suture, from the occipital bone to the hair line in front, and a transverse incision from the hair line downward. The flap is to be reflected back and a small opening made in the skull by means of a trephine; then, with Rongeur forceps, a groove is cut as far forward as the angle of the wound in front; from this point a lateral groove is made. The parts are then irrigated, all hemorrhage controlled, and the flaps brought together by means of interrupted silkworm-gut sutures. In from 6 to 12 months a similar operation should be performed on the other side of the sagittal suture.

MICROPHOTOGRAPHY.—The production of photographs of microscopic size, usually of large objects. These photographs must then be examined with a magnifier or microscope. In French and German this term is also employed for Photomicrography (*q. v.*).

MICROSCOPE.—An optical apparatus for giving an enlarged and distinct image of a minute and near object. There are usually 2 or more lenses or lens-systems, of which one, the objective, placed near the object, gives an enlarged and inverted real image. The other, the ocular, acting like a simple microscope, gives an enlarged virtual image of the real image.

The microscope is the most important laboratory instrument, and should be, so far as means will permit, the best that skill can produce. American microscopes are now as well made as those of foreign firms. The medium form of stand is of preference. The large stand is too heavy and too high. The necessary objectives are a low, a high, and a 1/12 oil-immersion. Two eye-pieces, a low and a high, will be found sufficient for ordinary purposes. The oil-immersion lens should always be cleaned after using by wiping off the oil with an old linen or silk handkerchief or with fine tissue-paper. If the lens is sticky, moisten the cloth with water or, where the oil has dried, with benzol or xylol. The same process may be used for the dry lenses, but it must be done quickly, so as not to soften the balsam in which the lenses are embedded. Ordinarily, a dry cloth is sufficient. The concave mirror is to be used only when some near object, such as wall objects, is reflected into the field of vision or when artificial light is employed. A Welsbach burner, or, better, the incandescent electric light with ground-glass globe, furnishes the best illumination. A piece of blue glass inserted over the mirror or just below the object to be examined will correct the slightly yellowish tint of these lights.



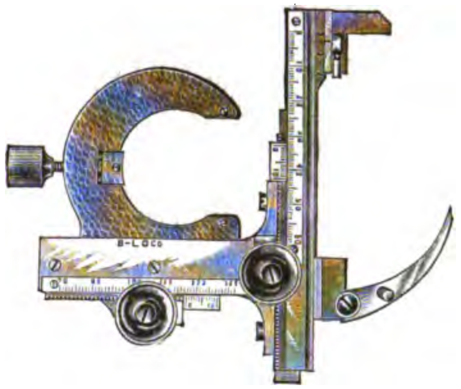
Microscope

E. Eyepiece; *D.* Draw tube; *T.* Body tube; *RN.* Revolving nosepiece; *O.* Objective; *PH.* Pinion head; *MH.* Micrometer head; *HA.* Handle arm; *S.* Stage; *SS.* Substage; *M.* Mirror; *B.* Base; *R.* Rack; *P.* Pillar; *I.* Inclination joint.

It must be recognized that the microscope is but an aid to one of our senses. It merely extends our power of observation. The formation of a diagnosis—the first aim of practical medicine—is the result of judgment founded upon observation, and the microscope permits wider application of the sense of sight.

With a **mechanical stage** the microscopist can examine systematically and conveniently an entire slide area. By means of the graduated scale readings, he also can locate a particular point on the field and return to it at any time by simply attaching his stage in the same position and setting his adjustments to accord with his original readings.

The clinical uses of the microscope extend to the investigation of the various discharges and secretions of the body, such as the urine, gastric contents, vomitus, feces, sputum, blood, milk, morbid discharges, cyst contents, cerebrospinal fluid, new growths, parasites, and to examinations of food-stuffs, drugs, and in medicolegal inquiries. Besides the microscope, the use of additional apparatus is required for the examination of tissues, microorganisms, and their secretions and products. As most secretions and discharges of the body are of a fluid nature, they do not require the addition of any medium; but if necessary, a 0.75 percent solution of sodium chlorid, or a 3 percent solution of glycerin in distilled water, having a few crystals or carbolic acid added to prevent the growth of fungi, will suffice. The preparation of specimens for microscopic examination is described under Pathologic Technic (*q. v.*).



Mechanical Stage

Hand Microtome

MICROSTOMA.—Any lessening of the size of the mouth, even to complete imperforation of the lips. It is either congenital or traumatic, arising from burns or syphilitic ulcers, etc. It is very rarely seen, except as the result of an accident. If there is complete imperforation, or if the mouth is so small that the child is unable to hold the nipple by the lips, a plastic operation must be immediately performed.

MICROTOME.—An instrument for making thin sections for microscopical examination. The microtomes of Schanze, Rutherford, Hamilton, Williams, Lewis, Jung, Leiter, Ryder, Minot, Bardeen, Ranvier, and Cathcart are the most used. A **freezing microtome** is one in which the tissue is frozen, in order to secure the hardness required for properly cutting sections. It operates by the rapid evaporation of ether or rhigolene through the medium of a special apparatus, after which the specimen is cut by means of the blade of a carpenter's plane. CO_2 liquid gas, also used, offers the most rapid and convenient method for freezing specimens for sectioning.

Celloidin Microtome.—Of this variety there are 2 types—one in which the section is raised by a screw, the other in which the object is raised by being moved up an inclined plane. (The first variety is preferred by Mallory and Wright.) By means of a sharp blade having the shape of a razor, placed at an angle, the specimen is easily cut after being hardened in celloidin.

Paraffin Microtome.—Frequently paraffin sections may be cut in a celloidin microtome, but one made specially for this work is preferable. That devised by Minot is advised.

MICTURITION.—See URETHRA, URINARY STREAM, URINE (Retention, Suppression).

MIGRAINE.—A unilateral paroxysmal pain in the head, periodic, accompanied by nausea, often vomiting, intolerance of light and sound, and incapability of mental exertion, the brain being temporarily prostrated and disturbed.

Synonyms.—Megrim; hemicrania; sick headache; bilious headache; blind headache.

Causes.—In the majority of patients the nervous predisposition to migraine is inherited, but whether inherited or acquired, it commonly develops before the age of 30.

Among the many exciting causes are eye-strain, disturbances of digestion, irritation of the ovaries or uterus, worry, exacting mental labor, sexual excesses, and insufficient sleep. The causes of many attacks, however, are wrapped in mystery.

Symptoms.—Attacks of migraine occur in irregular paroxysms, the intervals between being free from pain or nervous disturbance. For a day or two preceding the paroxysm it will be ascertained, on close questioning, that there were a feeling of fatigue without apparent cause, heaviness over the eyes, with some flatulency and indigestion. The attack proper is ushered in by chilliness, nausea, often vomiting, yawning, and general muscular soreness, with intolerance of light, and noises in the ears and incapability for mental exertion, and pain of a sharp, shooting character, of great intensity and persistency, localized most frequently in the frontal, temporal, or occipital regions of the left side; at the same time there is tenderness over the whole side of the head. Rarely, the pain is felt on the right side, and still more rarely on both sides at the same time. The nausea and other digestive symptoms may follow the onset of the pain instead of preceding it. There is more or less disturbance of the circulation, temperature, and secretions of the affected parts. At times there is a marked contraction of the vessels, when the face is pale, the eyes shrunken, and the pupils dilated; again, the vessels may be dilated, when the face is flushed, the conjunctivæ injected, and the pupils contracted. Motion, sound, and light aggravate the acute suffering.

The attack may continue with more or less intensity from a few hours to 2 or 3 days, the average duration being 24 hours.

Diagnosis.—The symptoms are so characteristic that an error seems impossible. It may, however, be confounded with anemic headache, hyperemic headache, dyspeptic or bilious headache, and neuralgic or rheumatic headache. The pains of organic brain disease must be excluded.

Prognosis is favorable. The affection is free from danger to life. In a fair number of cases the susceptibility to attacks declines as the person advances in years, it being rarely seen after 50 years.

Treatment must be directed to the cause. Any eye-strain, digestive trouble, or uterine disease must be corrected. To abort an attack of migraine or dispel a paroxysm after its onset, any one or two of 4 remedies are almost infallible. One is a hypodermic injection of morphin sulphate, 1/4 grain, with atropin sulphate, 1/120 grain, or antipyrin, 20 grains, repeated in an hour or two; or phenacetin, 10 grains, repeated in an hour or two. In many attacks fluidextract of cannabis indica, 2 or 3 drops every half hour or hour for a number of doses, is curative. The local use of menthol pencils eases the pain.

The following may be given:

℞.	Acetanilid,	gr. xx
	Codein sulphate, Monobromated camphor,	each, gr. v.

Make 10 pills. Take 1 pill every 2 hours until relieved.

In the intervals between the paroxysms measures to improve the general system should be used, and to overcome as far as possible any of the etiologic factors in its production. For this purpose extract of cannabis indica, 1/4 grain 3 times daily for several months, is highly recommended. See HEADACHE.

MILIARIA (Prickly Heat).—See SWEAT GLANDS; URTICARIA.

MILIARY FEVER (Sweating Sickness).—A rare infectious fever, occurring in epidemics in limited districts in Europe, characterized by miliaria, fever, and profuse sweating. Treatment is expectant and symptomatic.

MILITARY SURGERY.—Military surgery differs little from ordinary emergency surgery. The surgeon in daily practice has learned long ago that every accidental wound must practically be regarded and treated as an infected wound. In this respect the military surgeon of to-day has the advantage over his colleague in civil practice in knowing that the small-caliber bullet inflicts wounds which *per se* are more often aseptic than septic. Senn's experience in Cuba showed that the small jacketed bullet seldom carries with it into the tissues clothing or any other infectious substances. Most of the wounds of the soft tissues, uncomplicated by visceral lesions, which in themselves would become a source of infection, healed by primary intention in a remarkably short time. If infection followed, it usually did so in the superficial portion of the wound in connection with the skin, and, what is more than suggestive, the wound of exit was more frequently affected than the wound of entrance. This can be readily explained from the larger size of the wound and more extensive laceration and tearing of the tissues. In many of the cases ideal healing of the wound did not occur, owing to a subsequent limited superficial suppuration. The deep tissues were seldom implicated.

The many failures in protecting the more serious wounds against infection are attributable to 3 principal causes: (1) Inadequate supply of first dressing; (2) faulty application of first dressing; (3) unnecessary change of dressing. In all cases in which the first examination does not reveal the existence of complications which require subsequent operative treatment the diagnosis tag should convey this important instruction: "*Dressing not to be touched unless symptoms demand it.*" Such instruction is significant, and must be followed to the letter by all surgeons in subsequent charge of the patient.

For years Senn used as an antiseptic powder a combination of boric acid and salicylic acid, 4 : 1, with the most satisfactory results. He was also partial to sterile absorbent cotton for this particular purpose, as it constitutes a more perfect filter than loose gauze. A teaspoonful of this powder dusted on the wound forms, with the blood that escapes and the overlying cotton, a firm crust, which seals the wound hermetically. Should the primary dressing become saturated with blood, the same powder should be dusted over the wet dressing, and an additional compress of cotton is added to the dressing. After the first dressing has been applied it should not be removed except for good and convincing reasons. Much can be done in the after-treatment in the way of adjusting the bandage and immobilizing the injured part, but the first dressing must remain unless local or general symptoms set in which would warrant its removal. Malaria and yellow fever, in the tropics, are responsible for many unnecessary changes of dressing. The appearance of fever in a wounded man naturally leads to the suspicion that there is something wrong in the wound. Many dressings were changed on this ground; nothing abnormal was found in the wounds, and a day or two later the nature of the fever was recognized, and the patients were either given quinin or were sent to the yellow-fever hospital, in accordance with the diagnosis made. Every change of dressing, more especially in military practice, is attended by risk of infection, and must be scrupulously avoided, unless local or general symptoms indicate the existence of complications which demand surgical intervention. See GUNSHOT WOUNDS, ROENTGEN RAYS.

MILIUM (Grutum).—A skin-disease characterized by the formation of small, roundish, whitish, sebaceous, noninflammatory elevations situated just beneath the epidermis. They are found mainly on the face, eyelids and forehead of elderly persons, and may exist in immense numbers. They may undergo calcification, giving rise to *cutaneous calculi*.

Colloid milium is a rare skin disease, characterized by the presence, especially on the bridge of the nose, forehead, and cheeks, of minute, shining, flat, or slightly raised lesions of a pale lemon or bright lemon color. It is a form of colloid degeneration of the skin affecting persons of middle or advanced age.

MILK.—The secretion of the mammary glands of mammalia, consisting of water, casein, albumin, fat, milk-sugar, and salts. Cream consists mainly of the fats that rise to the surface of the milk. Skim-milk is the residue left after the removal of the cream. Buttermilk is cream from which the fatty matter has been removed. It should contain not less than 10 percent of cream. The reaction of milk, when first secreted, is alkaline, but it becomes acid on standing, as a result of fermentative processsses.

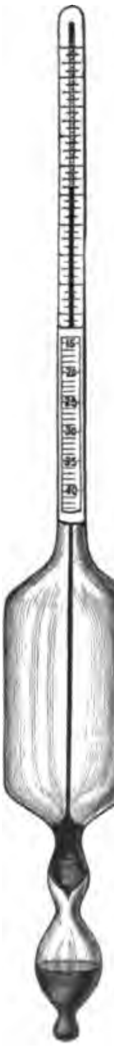
The following table (from Bartley) shows the chief differences between human and cow's milk:

PROPERTIES.	HUMAN MILK.	COW'S MILK.
Physical appearance.	Bluish, translucent, odorless, sweetish.	Opaque, white or yellowish-white, distinct odor, feebly sweet taste.
Specific gravity.	1026 to 1036.........	1029 to 1035.
Reaction....	Amphoteric or slightly alkaline.	Amphoteric or slightly acid; becomes quickly acid on exposure to air.
Behavior on boiling.	Does not coagulate, and forms a very slight pellicle, scarcely observable.	Does not coagulate, but forms a distinct pellicle of casein and lime-salts.
Spontaneous coagulation..	Coagulates only after one to two days, at room temperature.	Coagulates after six to twelve hours at room temperature; due to lactic acid.
Coagulation with rennet.	Coagulates incompletely in small, isolated flocculi, never forming visible curds.	Coagulates at body temperature, separating into curdy masses and opalescent whey.
Fat.........	Butter yellowish, similar to cow-butter; sp. gr. at 15° C. = 0.966; melts at 34° C.	Butter yellow-white; sp. gr. at 15° C. = 0.949 to 0.996; melts at 35.8° C.
Composition of fat.	Olein, palmitin, stearin, butyrin, caprin, caproin, myristin.	Olein, palmitin, stearin, caproin, caprylin, caprin, laurin, myristin, arachin, butyrin, lecithin, cholesterin.
Relation of acids.	Volatile acids relatively small; oleic acid, one-half nonvolatile acids.	Volatile acids relatively large, oleic acid small, palmitic and stearic large.
Casein.......	Precipitated with difficulty by salts and acids; easily soluble in acids; leaves no pseudonuclein with peptic digestion.	Precipitated easily by salts and acids; precipitate not easily soluble in excess of acids; leaves residue of pseudonuclein.
Composition of proteids.	Lactalbumin, lactoglobulin, and casein; ratio of casein to albumin, 1 to 2 (?).	Lactalbumin and globulin small; casein to albumin, 1 to 7, or even 1 to 10.

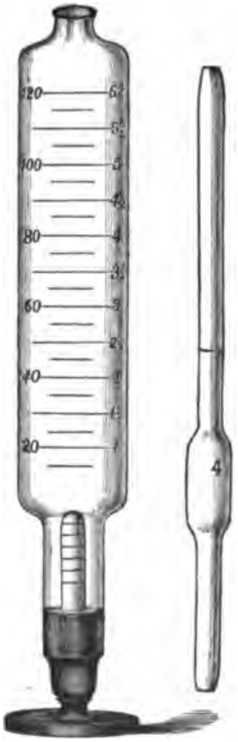
Properties.	Human Milk.	Cow's Milk.
Mineral matters.	Relatively small amount; contains one-sixth as much CaO and one-fourth as much P_2O_4 as cows' milk.	Contains relatively large amount.
Bacteria.....	Generally sterile: rarely staphylococcus albus and aureus.	Contains numerous bacteria, and occasionally typhoid, diphtheria, tubercular organisms, etc.
Citric acid...	About 0.05 per cent..	About 0.1 to 0.15 percent.
Enzymes....	Amylase, lipase, and fibrin ferment.	Amylase, oxidase, and proteolytic ferment.

Determination of Specific Gravity and Percentage of Fat.—The specific gravity of milk may be easily determined by a **lactometer** or **"lactodensimeter"** (such as Quevenne's). The temperature of the milk should always be 60° F.

Estimation of Percentage of Fat.—For this the **lactoscope** of Feser is used. The process, as given by Simon, is as follows:



Quevenne's Lactodensimeter.—(*Simon's Clinical Diagnosis.*)



Feser's Lactoscope.—(*Simon's Clinical Diagnosis.*)

Milk is drawn into the pipet up to the mark "M" when it is emptied into the cylinder "C." The former is then at once rinsed with water and the washings added to the milk. While shaking, water is further added, until the black lines upon the milk-colored glass plug "A" can just be discerned. The figure upon the right of the scale which is reached by the mixture will then directly indicate the percentage amount of fat, while the number upon the left indicates the amount of water that has been added. See Colostrum.

MILK, ARTIFICIAL. See Milk (Modified).

MILK, DRUGS EXCRETED IN.—When taken during lactation, the following drugs are excreted in the milk: the oils of anise, cumin, dill, wormwood and garlic, turpentine, copaiba, the active principles of rhubarb, senna, scammony and castor oil, opium, iodin, indigo, antimony, arsenic, bismuth, iron, lead, mercury and zinc. Acids given to the mother cause griping in the child. Natural salts, as a rule, and the purgative agents above-named, act as purgatives to the child, and potassium salts as diuretics. Turpentine, copaiba and potassium iodid given to the mother, can be detected in the urine of the child. Opium given to the mother may narcotize the child, and mercurials in the same manner may salivate it. Atropin, hyoscyamin, the salicylates and potassium sulphid have been found in the milk after their ingestion by the woman.

MILK, FILTERED.—It has been observed that milk carefully filtered through a thick layer of absorbent cotton is freed from dirt and, to a great extent at least, from germs, and the quality of the milk is in no way altered. In this process we have, therefore, a simple method of sterilizing milk for infants' food without the application of heat, which, no doubt, in many cases changes the nutritive quality, and is in certain instances a cause of scorbutus and other disorders of nutrition.

Milk may be satisfactorily filtered by placing in a clean glass funnel a piece of absorbent cotton about an inch thick, and allowing the milk to percolate through it into the nursing-bottle.

MILK, MODIFIED.—The modification of cow's milk consists in changing the proportions of the different ingredients until they resemble as closely as possible those of mother's milk. The following table gives the average percentage of the different ingredients in cow's milk and mother's milk:

	Cow's Milk.	Mother's Milk.
Fats................	4 percent	4 percent
Sugar...............	4.30 percent	7 percent
Proteids............	4.00 percent	1.50 percent
Salts...............	0.70 percent	0.20 percent
Water..............	87.00 percent	87.30 percent
Specific gravity.......	1029	1031
Reaction............	Acid (not sterile).	Alkaline (sterile).

By referring to the foregoing table it will be noticed that in altering cow's milk to the standard of human milk the greatest differences to be overcome are in the proportions of the proteid elements, the salts, and the sugar; in cow's milk the two first being too abundant and the last deficient. In laboratories specially fitted up for the purpose milk may be modified exactly to any desired proportions, but in the household or nursery this is not possible, and we are obliged, therefore, to follow certain general and simple rules by which we may practically be able to adjust the milk to the child's digestive powers and furnish its system with the proper elements of nutrition.

To accomplish this end, keeping in mind woman's milk as the standard, it is necessary:

1. To reduce the proteids. This is done by adding water—as much or a little more water than we have milk.

2. To increase the sugar, which at first was deficient, and by dilution has been made still more so. It is necessary to add about 10 grains of sugar to each ounce, or a heaping teaspoonful to each 8-ounce feeding. Milk-sugar is usually recommended, but as it is more liable than cane-sugar, especially in hot weather, to cause fermentation, the latter is better for ordinary use. Whichever is used, it should be dissolved in a little hot water before being added to the milk.

3. To add cream, which at first was sufficient, but has been much reduced by the water which has been added. It is necessary, to bring the fats up to the standard, to add about 1 1/2 to 2 teaspoonfuls to each ounce, or 1 1/2 to 2 ounces of cream to each 8-ounce feeding.

4. It is necessary to add an alkali—about 10 grains of bicarbonate of sodium to an 8-ounce bottle. The salts, by dilution, have been reduced to about the standard.

5. The milk must be freed from germs, which may be practically accomplished by filtering or, if preferred, by pasteurizing.

Milk modified as above would be expressed in the following recipe for a child 6 or 7 months old:

℞.	Cream,	℥ jss
	Milk,	℥ iij
	Boiled water,	℥ iijss
	Sodium bicarbonate,	gr. x
	Sugar,	ʒ j.

Mix, filter or pasteurize, heat to 98° F., and feed every 3 hours.

See Modified Milk in Infant Feeding.

MILK, MOTHER'S.—For table giving the average percentage of the different elements of human milk, see Milk, and Milk (Modified).

The color is bluish-white; taste, sweet. Microscopically may be seen great quantities of fat globules and, perhaps, a few epithelial cells. Slight coagulation is produced by adding acetic acid or digestants, such as liquid rennet; but when in a normal condition, it never coagulates in large, hard masses, as does cow's milk.

The first 2 days after parturition the amount secreted is very small, but after 3 to 5 days there should be an abundant supply. Milk is formed to some extent in the gland all the time, but most plentifully while it is being stimulated by the child suckling.

Colostrum is the secretion of the first 2 or 3 days, and it differs quite markedly from the later milk. It is a deep yellow color; is not so sweet as the later milk; has a specific gravity of 1040 to 1046; coagulates into a solid mass by heat; is very rich in proteids and salts, and has a laxative effect. Microscopically there are seen, besides the fat globules, large numbers of granular bodies, known as colostrum corpuscles, which gradually disappear from the milk by the end of a week or 10 days. See Colostrum.

Tests.—When a child fed at the breast does not thrive, the milk should be tested. The specimen used should be the whole quantity, preferably, from a breast, as the quality varies according to the time it is taken, the first milk being poorer in fats and richer in proteids, and the last milk, or the strippings, being rich in fat and low in proteids.

An easy clinical method of testing the milk is the following:

Too high specific gravity shows excess of proteids. Too low specific gravity, excess of fats. The sugar and salts are practically constant.

To ascertain the percentage of fats, take a cylinder holding 10 c.c., graduated to 100 parts; fill to the 100 mark with the milk, and allow the cream to rise for 24 hours. The cream bears the relation of 5:3 of the fat, so if the reading on the cylinder shows 7 of cream, the fats would equal three-fifths of 7, or 4.2 percent.

Normal human milk will frequently vary considerably in the percentage of its elements and be at the same time abundantly nutritious to the child which is fed upon it. If the percentages are far from the average, however, and the child shows symptoms of inadequate nursing, much may often be done toward correcting the faulty condition by regulating the mother's mode of life, as regards her exercise and diet. As a general rule, it should be remembered that lean and rare meats and other albuminous foods will increase the fats, and exercise will reduce the proteids. Below are given some of the conditions which affect the secretion of the milk.

1. **Too frequent** or **prolonged nursing** causes the milk to be poor and weak.

2. **Age.**—A woman very young or over 40 is likely to have milk weak in cream and rich in proteids.

3. **Acute illness,** except fevers of a severe type, do not alter the quality. Such fevers, however, will reduce the cream and increase the proteid constituent.

4. **Menstruation** does not materially affect the quality.

5. **Pregnancy.**—The milk of a pregnant woman is usually small in quantity and poor in quality.

6. **Drugs.**—See Milk, (Drugs secreted in).

7. **Nervous impressions,** when marked, have a decided effect upon the milk. Fatigue, exhaustion, great excitement, sudden fright, grief, or passion may affect it so as to cause an acute indigestion only, or, in other cases, grave toxic symptoms, as high temperature, great prostration, or even convulsions.

8. **Diet.**—Nitrogenous foods increase the fats and

proteids. Vegetable diet diminishes both the fats and proteids. A very low diet diminishes the fats and may either increase or diminsh the proteids. An excessively rich diet increases both the fats and proteids. Liquids increase the quantity. Alcoholic drinks or malt extracts, porter, etc., increase the quantity; also the fats and usually the proteids.

9. **Massage of the breasts** is one of the most efficient means of stimulating the milk-supply. It should be done with great care and gentleness, and with every precaution against infection. The entire breast should be rendered aseptic, as should also the hands of the operator, and massage should be done 2 or 3 times a day. Some mild antiseptic ointment may be used with the massage.

See BREAST; MILK.

MILK, PASTEURIZED.—By pasteurizing milk we mean heating it to a temperature of 140° to 160° F. for a period of 20 minutes. This process has been shown to be sufficient to destroy the germs (but not their spores) most commonly to be found in milk, as the bacilli of typhoid fever, cholera, diphtheria, tuberculosis, and the pus germs. Milk thus treated will keep 2 or 3 days in a room at the ordinary temperature, and on ice for several days. Milk heated to 167° F. has no objectionable taste, and it is thought that its digestibility and nutritional qualities are not changed.

MILK, PEPTONIZED.—The following is a simple rule for peptonizing milk: In a clean glass jar containing 4 ounces of cold distilled or boiled water dissolve 15 grains of sodium bicarbonate and 5 grains of pancreatin (extractum pancreatis), to which add 12 ounces of good milk. Set the jar in a vessel of water at a temperature of 105° to 115° F. for from 5 to 20 minutes to partially peptonize, and for 2 hours to completely digest or peptonize.

MILK, PREPARED.—See MILK (Modified).

MILK, STERILIZED.—Sterilized milk is that in which the germs have been destroyed by heat. This can be accomplished absolutely only by heating it to 212° F. or higher on 2 or 3 successive days, as in preparing a culture medium. The ordinary method of sterilizing is to place the milk in jars, which are then exposed to the action of steam for an hour and a half. Heating to so high a degree causes the quality of the milk to be changed, and it is therefore rendered unfit for infant's food, except as a makeshift in very hot weather when ice cannot be procured, or when it is necessary for it to be kept for a considerable time, as in traveling when fresh milk cannot be obtained.

MILK LEG.—See PHLEGMASIA ALBA DOLENS.

MILK SICKNESS (Trembles, Slows, Puking Fever).—An acute infectious disease prevailing in newly settled lands in the western and southern parts of the United States, transmitted to man through milk, cheese, butter, flesh of affected cattle. The specific cause is unknown. It is characterised by vomiting, trembling, constipation, fetid breath, thirst and moderate fever. The disease is generally fatal. Treatment is symptomatic and eliminative.

MINERAL WATERS.—Natural water differs from distilled water in containing saline and other constituents in varying proportions; from common water, in which they are so small in quantity as not to alter the taste, color, etc., up to the sea-water, having 3 1/3 percent, and that of the Dead Sea, with 26 1/2 percent. Spring waters impregnated with foreign substances so as to have a decided taste and a marked action on the human system are called mineral waters, and may be subdivided into various groups, according to their prevailing constituents, as carbonated, alkaline, saline, sulphureted, silicious, etc. Full analyses of all the principal mineral waters of Europe and America are given in the fifteenth edition of the United States Dispensatory, but a few of the most prominent will be mentioned here.

Alkaline Mineral Waters.—Ems, Germany; Salzbrunn, Germany; Gleickenberg, Austria; Vichy France; Vals, France; Bladon Spring, Ala.; Congress Spring, Cal.; Seltzer Spring, Cal.; St. Louis Spring, Mich.; Buffalo Lithia Spring, Va.; Hot Spring, Va.; Warm Spring, Va.; Berkeley Spring, Va.; Bethesda Spring, Wis.; Gettysburg Spring, Pa.

These waters are generally cold, those of Vichy and Ems being warm. They contain a considerable amount of sodium carbonate, also sodium chlorid and sulphate, and various other chlorids, carbonates, and sulphates, with carbonic acid gas in varying quantity. Vichy and Vals waters depend for their efficacy almost wholly on the quantity of sodium carbonate contained in them, which is for Vichy from 26 to 50 grains and for Vals about 60 grains to the pint.

Saline Mineral Waters.—Freidrichshall, Germany; Hunyadi János, Germany; Baden-Baden, Germany; Cheltenham, England; Kissingen, Bavaria; Reichenhall, Bavaria; Wiesbaden, Germany; Carlsbad, Bohemia; Püllna, Bohemia; Seidlitz, Bohemia; Marienbad, Bohemia; St. Catherine's Ontario, Canada; Adelheidsquelle, Bavaria; Kreutznach, Prussia; Saratoga Springs, N. Y.; Ballston, N. Y.; Hot Springs, Ark.

These waters are of more complex composition, the various waters of Saratoga containing more than thirty constituent salts. Those usually present are the sulphates and carbonates of sodium, calcium, magnesium, etc. (*magnesian waters*); chlorids of sodium, potassium and lithium (*chlorinated waters*); ferrous salts (*chalybeate waters*), with iodin, bromin, manganese salts, and phosphates in some few. Carbonic acid gas is present in all. Most of them are purgative, some are considered alterative, and many are warm (100° to 160° F.). The most powerful of the saline group is the Hunyadi János, containing about 150 grains each of magnesium and sodium sulphates to the pint; it is effectively purgative. Püllna water is nearly as strong, with 124 grains of sodium sulphate and 93 grains of magnesium sulphate to the pint. Friedrichshall is less powerful, but a better aperient water in 6- to 10-ounce doses. Marienbad contains no magnesium sulphate, but has 36 grains of sodium sulphate, 9 of sodium carbonate, 11 of sodium chlorid, and a small quantity of ferrous carbonate to the pint; in transportation it loses its carbonic acid and deposits the iron; in ordinary doses it is not aperient. Carlsbad water contains

20 grains of sodium sulphate and 9 each of sodium carbonate and chlorid to the pint. "Carlsbad salt" is simply sodium sulphate with a trace of the carbonate. These waters are either imported or are made in the United States.

Sulphurous Mineral Waters.—Aix-la-Chapelle, Prussia; Barèges, South France; Eux-Bonnes, South France; Llandrindrod, Wales; Harrowgate, England; Blue Lick Springs, Ky.; Sharon Springs, N. Y.; Yellow Sulphur Springs, Va.; White Sulphur Springs, W. Va.

These waters contain sulphureted hydrogen gas, also carbonic acid gas and carbonates, chlorids and sulphates of sodium, potassium, magnesium, and calcium; sometimes carbonate and oxid of iron, iodid and bromid of sodium.

Carbonated Mineral Waters.—These waters are cold, contain generally carbonates of calcium, magnesium and sodium (in some, iron), which are held in solution by the excess of carbonic acid, also chlorids of sodium and postassium, sulphates, phosphates, etc.

Silicious Mineral Waters.—Hot Springs, Iceland; and the geysers of Yellowstone Park. The constituents of these waters are chiefly alkaline silicates.

Therapeutics.—An undue value is placed by the laity and interested proprietors upon the medicinal value of mineral waters. The benefit in most instances from them is due to change of climate and scene, freedom from business and home cares and worry, regularity of life and diet, drinking water in quantity, and, in many instances, the substitution of water for alcoholic beverages. Those springs which are furthest removed from the patient's residence, are, as a rule, of the most value to him, as similar invalids whose homes are in the vicinity of the springs are often not benefited by its water.

The principal affections in which mineral waters are esteemed are the following: Cirrhosis of the liver, dyspepsia, gout, rheumatism, uricacidemia, lithiasis, hepatic diabetes, constipation, strumous disorders, obesity, plethora of the pelvic organs, hypochondriasis, skin-diseases, especially those dependent on gastric derangement, phthisis, constitutional syphilis, metallic poisoning, etc. Aperient and purgative waters are useful when a prejudice exists against purgative medicine. See WATER, GOUT, RHEUMATISM, CONSTIPATION, etc.

MIOSIS.—Contraction or decrease in the size of the pupil. See PUPIL.

MIOTICS (Myotics).—Agents which cause the contraction of the pupil. They act by stimulating the motor oculi nerves supplying the circular muscular fibers of the iris, and produce this effect when locally applied or internally administered, except morphin, which acts centrally, and does not affect the pupil when applied locally. Physostigmin (eserin) is the chief miotic for local use, and the only one employed in ophthalmic practice. Others are muscarin, pilocarpin, and nicotin. *Physostigmin* also contracts the ciliary muscle, leaving the eye accommodated for the near point only, and lessens intraocular tension, antagonizing exactly the eye-actions of atropin. *Morphin* given internally produces miosis by stimulation of the oculomotor centers probably, the dilatation which occurs as death approaches being due to final paralysis of the same (Wood). The *general anesthetics* dilate the pupil in the first and last stages of their action, but contract it in the middle stage, that of complete anesthesia. When in this stage dilatation occurs, it is a dangerous sign of failing respiratory power, unless it is accompanied by symptoms of returning consciousness, as reflex movements and vomiting.

MIRYACHIT.—A peculiar disease observed in some Oriental tribes, the chief characteristic of which consists in mimicry by the patient of everything said or done by another. The same disease is called *lata* by the Javanese. It is also allied to the disease of the "jumpers" of Canada.

MISCARRIAGE.—The expulsion of the fetus between the fourth and the sixth months of pregnancy. See ABORTION.

MISSED ABORTION.—Death of the ovum during the first few months of gestation, followed by symptoms of abortion, which gradually subside without expelling the uterine contents. The ovum may remain inside the uterus for an indefinite period. More frequently decomposition, resulting in some form of sepsis, will occur. The treatment should be complete removal of the blighted ovum. See ABORTION.

MISSED LABOR.—Retention of a dead fetus in the uterus for a variable period of time after the normal expiration of pregnancy. There are usually a few slight pains at term, which gradually subside. Missed labor is most frequently the result of an extrauterine pregnancy that has advanced to term, or of pregnancy in one horn of an imperfectly developed uterus. It may be due to cicatricial contraction of the cervix. See LABOR.

MITRAL DISEASE.—See HEART-DISEASE (Organic).

MIXED TREATMANT.—See SYPHILIS.

MIXTURES (Misturæ).—Aqueous liquid preparations intended for internal use, which contain suspended insoluble substances. The term "mixture" is used somewhat indiscriminately.

There are four official mixtures, as follows:

TITLE.	CONSTITUENTS.	PROPERTIES AND DOSE.
MISTURA:		
Cretæ (*chalk mixture*).	Compound chalk powder, 20 gm.; cinnamon water, 40 c.c.; water, sufficient to make 100 c.c.	Antacid, 4 drams.
Ferri composita (*Griffith's mixture*).	Ferrous sulphate, 6 gm.; Myrrh, 18 gm.; sugar, 18 gm.; potassium carbonate, 8 gm.; spirit of lavender, 60 c.c.; rose water, sufficient to make 1000 c.c.	Tonic, 4 drams.
Glycyrrhizæ composita (*Brown mixture*).	Extract of liquorice, 30 c.c.; syrup, 50 c.c.; acacia, 30 gm.; camphorated tincture of opium, 120 c.c.; wine of antimony, 60 c.c.; spirit of nitrous ether, 30 c.c; water, sufficient to make 1000 c.c.	Expectorant, 2 drams (child, 1 dram).

Title.	Constituents.	Properties and Dose.
Mistura:		
Rhei et Sodæ...	Sodium bicarbonate, 35 gm.; fluidextract of rhubarb, 15 c.c.; fluidextract of ipecac, 3 c.c.; glycerin, 350 c.c.; spirit of peppermint, 35 c.c.; water, sufficient to make 1000 c.c.	Carminative. Dose, 1 dram.

MODIFIED MILK IN INFANT FEEDING.—*No susbtitute can compare with mother's milk* for infant feeding; and next to mother's milk modified cow's milk is the best. Where cow's milk is not obtainable, the adaptation has been made from the animal which, in that region, can produce the most abundant supply of milk. Thus in certain places goat's milk or the milk of the ass may be used. Cow's milk in this country has always offered the best substitute in infant feeding. It contains the same ingredients as human milk, but in materially different proportions. The first attempts at feeding with cow's milk were made by simple dilutions with water. This procedure met with success in many instances, and continues to do so when a perfectly healthy, normal baby is the subject. But it was soon found that a certain percentage of infants thus fed developed indigestion. At first attention was focussed on the tough hard curds that these cases either vomited or passed in their movements. This was attributed to the higher amount of proteid that appears in cow's milk as compared with human milk. When simple dilutions failed, the fact that cow's milk differs slightly in its reaction from that of human milk—being amphoteric instead of alkaline—was considered to be the cause of such failures. Therefore lime water was added to all milk given to infants in order to overcome this slight acidity, or bicarbonate of sodium was added to produce a more marked alkalinity. Later on, pancreatizing, or peptonizing as it was then called, was used in special cases to facilitate digestion. Breaking up of the curds was also attempted by the use of cereal diluents which produced a fine division of the proteid matter in the milk mixtures.

The first attempt to direct a more scientific spirit rather than empiric toward the question of infant feeding was in the comparative study of the different ingredients in human milk and cow's milk. The prevalent idea was that an exact reproduction of the percentage composition of human milk would solve all the difficult problems in the use of cow's milk. This premise though a failure, has, as a scientific advance, proved a right step. The successes of percentage feeding have not been due to the often attempted and as often defeated plan of reproducing or imitating nature, but to the plan of adaptation.

Present Understanding of Percentage Substitute Feeding.—To-day advocates of scientific accuracy in infant feeding make no attempt at blindly following nature, but teach the use of the means nature has given us more scientifically and accurately. Thinking of the elements of milk in percents is the simplest as well as the surest way of dealing with such a complex food. It is *not*, however, a method of feeding in itself, but of adapting the proper parts to the demands of the individual infant. Any successful method of feeding devotes its time to acquiring a complete understanding of the demands and needs of the individual infant. This is the most important premise in infant feeding. There are no rules in infant feeding which a text-book or lecturer can give as absolute or infallible.

Let it be understood, then, that the percentage system is not a method of feeding, but a scientific procedure of computing the ingredients which we are to use in our milk for feedings.

The first step in the intelligent understanding of infant feeding is to know as accuarately as possible the feeding history of the infant to be cared for. What food it has been having is hardly sufficient—a knowledge here of the exact amounts of each ingredient, how each of these has been assimilated and how excreted; the amounts at each feeding, and the intervals between feedings; the source of the milk, whether dirty or clean, whether cooked or raw; the weight of the child, its average loss or gain in weight; all these are vitally necessary questions. The age of the child is of less importance and it is often of advantage to form our judgments of the needs and powers of assimilation of the infant before we know its age. No rules can be based upon age alone. What the child should have as food depends on far more essential features than age. The physiologic development, the powers of assimilation, the individual response to outside energy, *i. e.*, food, the powers of resistance, the equilibrium of the child in its relation to the outside world—these are the important features of the case. Every child is a law unto himself and only broad principles for treatment can be laid down.

Cow's milk has the following average composition according to König:

Water,	87.7
Casein,	3.0
Whey proteid,	0.4
Fat,	3.7
Sugar,	4.5
Ash,	0.7

Breast milk is composed of water, proteid, fats sugar and salts. The proteids, fats and sugar, vary widely even within normal limits during different periods of lactation and under various conditions, This is well shown by a comparison of different authorities:

Authorities,	Proteid, percent.	Sugar, percent.	Fat, percent.
Pfeiffer................	1.049–3.04	4.20– 7.60	0.70–9.00
Johanesson and Wang...	0.900–1.30	5.90– 7.80	2.70–4.60
V. and J. Adriance......	0.230–2.60	5.35– 7.95	1.31–7.61
Schlossman.............	0.560–3.40	5.20–10.90	1.60–9.46

Under even these wide variations a breast-fed infant normally does perfectly well.

The same variations occur from simple cow's milk, especially in the fats and proteids, according to Von Styke: Proteid, 2.19 to 8.56 percent; fat 2.25 to 9.00 percent. This can be almost wholly overcome by using the mixed milk for a herd when the variation ought never to be more than fat 3 to 5 percent; proteid 3 to 4 percent.

But even minimizing these variations is often not enough. The different elements vary in the different breeds of cows. Jersey and Guernsey cows' milk is always higher in its fat percentage; and, what is more important, the form in which the fat is emulsified is different. In Jersey milk the fat globules are large and the emulsion coarse. The digestion and assimilation of fat so coarsely emulsified is very much more difficult than is the finer emulsification found in Holstein, Durham or Ayrshire breeds of cows. Therefore either a pure or a mixed herd from these breeds is best chosen for producing milk for infant feeding. The conditions under which the milk is produced plays an important part. Unless milk is produced under the most approved sanitary and hygienic conditions, such as are demanded by certified milk (10,000 bacteria to the c.c.), disastrous results may follow in the form of acute bacterial intestinal infections, to which is due a large part of the infant mortality, especially in our large cities. Hence first of all in infant feeding we must know the kind of milk we are to use, both as to its average composition and under what conditions it is produced.

The individual ability for assimilation and digestion of the various constituents of milk differs with each infant. No rules can be laid down, but the following general principles (gained from scientific study) are of value.

Amount of Feedings.—The amount given must depend on the size of the infant. At any age an infant's physiologic capacity exceeds what is called its anatomic gastric capacity. Mosenthal's data give perhaps the best figures as to the amounts that can be given at a single feeding:

At the end of the first month 115 c.c., a scant 4 ounces.
At the end of the second month 125 c.c., a trifle more than 4 ounces.
At the end of the third month 145 c.c., a trifle less than 5 ounces.
At the end of the fifth month 170 c.c., a trifle less than 6 ounces.

Intervals of Feeding.—This would rationally depend on the rapidity with which an infant empties its stomach. A breast-fed infant empties its stomach in from one and a half to two hours, because of the physiologic fact that human milk is prepared for its passage into the duodenum sooner than cow's milk, this latter requiring from three to three and a half hours. This is due to the complex processes that take place in the stomach during digestion. It has been shown that the weaker the food the more rapidly is the stomach emptied. In its physiologic activity, the stomach begins the secretion of rennin and hydrochloric acid a few minutes after milk first enters so that the coagulation of the casein is finished in a few minutes after milk enters the stomach; the liquid part of the food, water, sugar, and salts are rapidly passed on into the duodenum. The esophageal orifice remains open as long as the contents of the stomach are alkaline and closes when they become acid. Whereas the pyloric orifice responds to exactly the opposite reaction, opening when the fluid portions coming in contact with it are acid, and closing when they are alkaline. The effect is the opposite in the reaction on the duodenal side of the pyloric orifice, which permits of an opening only when the duodenal contents are alkaline. The pyloric orifice reacts by closure to any but finely divided particles, making it difficult for the stomach to empty itself when digesting the more resistant curds formed from cow's milk. It takes longer for an acid reaction to appear because casein predominates to such an extent in cow's milk that the appearance of hydrochloric acid is delayed for two or three hours after the coagulation of cow's milk. After taking human milk, the hydrochloric acid appears between forty minutes and one hour and a half.

The capacity in the healthy infant for digesting and assimilating casein, whether human or cow's appears to be about equal. The difference in the two proteids comes from the great variation in proportion in which the whey proteids and the casein exist in the two milks. The proportion in human milk is almost 1 to 1, while in cow's milk it is 1 to 6. And this difference is the more important when we appreciate the biologic work on the colloidal properties of milk done by Alexander and Bull on the difference of the two proteids. Colloids are of two classes. One is readily coagulated when it comes in contact with electrolytes, such as hydrochloric acid, and after being acted on or coagulated is not reconvertible. These are called irreversible or unstable colloids. Casein belongs to this class.

The other class can be redissolved after dessication and is not affected by electrolytes. They further have the property of protecting the irreversible colloids from the action of electrolytes. The importance of whey mixtures in certain cases where the electrolytic action is too strong or where there is need of protecting the casein from too rapid coagulation is easily comprehended. And this biologic fact explains more clearly why we have such a fine flocculent coagulum formed in human milk as compared with the tougher coagulum or curd found in cow's milk from the action of hydrochloric acid. At present it is even being questioned whether "Casein Curds" are ever due to the casein in cow's milk. It has been argued that because there is no relation between the nitrogen content of the food and the nitrogen content of the stools "casein curds" do not point to proteid indigestion. However, Talbot has proved by indisputable biologic methods that cow's casein does appear in the so-called "casein curd." And there can be little question clinically that casein indigestion does exist and can be produced experimentally in certain cases by the addition of fat-free milk. In some cases the addition of even an ounce of fat-free milk will be sufficient to produce tough curds in the movements, whereas the addition of whey would have no like effect. So it may be safely said that although the proteid element in milk will cause us the least amount of trouble in substitute feeding, yet it can and does cause definite trouble if not properly managed, and may do considerable damage if the symptoms are not recognized and the casein element diminished low enough to check the formation of curds. Whey may even be the portion of the proteid at fault as shown by Meyer's experiment of substituting cow's whey to a mixture of mother's casein and fat, which caused an intestinal upset that did not occur when mother's whey was used in combination with cow's casein and fat.

The digestion of fats in infants is a still more complex problem. Schwartz has shown that the fat globules of cow's milk are rolled together in large clusters and clumps and that the fat globules are surrounded by a zone of clear substance called periglobular substance, which in cow's milk is easily broken through, allowing the globules to flow together into larger clusters. In human milk, the globules are much finer and more evenly distributed about the field and the periglobular substance is not as easily broken through. Upon heating, the periglobular substance in cow's milk seems to become more elastic and the fusion of the fat droplets much less easily accomplished. This may account for the greater digestibility of heated cow's milk over raw cow's milk in some cases. These mechanical differences certainly play important rôles, but there are some chemical and physiologic differences which are of great importance. There is more oleic acid found in human milk which has a lower melting point than fatty acids found in cow's milk (100 to 102° F. in human; 104 to 106° F. in cow's). In human milk there are lesser amounts of volatile acids, and the iodin combining power is higher in human milk—30 to 50 percent—while it is only 20 to 30 percent in cow's milk. Fat is also the last element to leave the stomach and in several instances more fat has been recovered from the stomach contents than had been taken in the previous 24 hours. With an excess of fat in the food, which at present we can only regulate quantitatively, we are not in a position to do anything but reduce the total amount. Future investigations will undoubtedly explain many things and point out how we can better adapt the fat of cow's milk to the infant's digestive capacity. One thing we have learned is that, normally, any percentage above four is fraught with danger, and in the infant below normal a much smaller percentage is alone safe even though there is no sign of fat intolerance or insufficiency shown in the stools. Uffenheimer claims that all the necessary ferments exist from the first in infants, so that it is possible that starches can be broken down and the double sugars split into simple sugars, in which condition alone can they be absorbed from the very first. Milk sugar has the slowest ratio of absorption. The amyolytic action of saliva is very weak before the sixth month, but after that time it increases rapidly until at the tenth month the action is double the strength of that at birth. From then until the fourth year there is very little gain in strength. Sugars and starch cause little trouble in the normal infant, but they may become very important and disturbing elements if the fat assimilation is much disturbed. According to Finkelstein, sugars and starch together with the salts may become the most important factors in alimentary decomposition and intoxication. "Sugar," says Finkelstein, "is the element that produces the temperature in these cases of decomposition."

The importance of salts in metabolism has been increasing steadily as our appreciation of their intimate relation and significance in vital processes has become more exact. Human milk supplies less salts than cow's milk, but the amount of salts that is capable of absorption in human milk exceeds that in cow's milk by about 20 percent. And the amount retained varies even more, being about 40 to 50 percent for human milk and only 15 percent for cow's milk. When there is fat intolerance the salts appear in the stools as soaps, and the loss of these salts cannot be made up by the addition of salts to the feeding. The salts principally affected are calcium and magnesium. These salts are also changed into insoluble forms by heating, and this important fact may explain the objection to heated milk when there is need of salts in the infant's metabolism. The rate and amount of absorption also changes during any illness, especially intestinal, though the extent of these changes has not been worked out, but their close relation to the weight curve when given in sufficient or insufficient amounts is fairly indicative of their importance. The next few years will probably see many changes in the knowledge of their exact and relative importance. It is necessary for us to consider these more scientific findings of late years as dominant factors in any attempt at feeding infants. We must understand the physiologic processes in an infant, and appreciate as fully as our present knowledge will allow us to do what these physiologic powers will permit in the digestion of the different food stuffs which we give in cow's milk. Besides appreciating these physiologic facts of digestion we must also understand the needs of each individual child. An infant needs nourishment for more purposes than an adult. The necessity for growth is far greater in infancy than at any other time. This body substance can alone be supplied by the proteid or nitrogen element in cow's milk. The younger the child the higher is the percentage of nitrogen that can be utilized. This varies greatly in health and disease. It is undoubtedly less during sickness, but may even exceed the normal during convalescence. Proteid also goes toward the repair as well as the building up of the body, and under certain conditions it may lend itself to furnishing body heat and energy, though when used for this it is far from being an economical process, as over 25 percent is not available for body heat and is given off as free heat. This function of supplying heat and energy is better supplied by the carbohydrate portion of the diet which has the same value per gram as the proteid, but is far more easily and completely vitalized and protects the wasteful combustion of proteid more than any other element. Heat and energy are supplied to a far less degree by the fats, which, however, go toward the increase in weight and stored-up energy. Just how this is accomplished is not perfectly clear nor is it known in what proportions the fats are carried through the blood and lymph

In determining the needs of an infant, therefore, its weight is an important factor and, except during the time of sickness when the weight is less, fairly represents the physiologic stage of development. It must also be remembered that during convalescence from acute infections other than alimentary disorders the needs and power of assimilation may far exceed that indicated by the weight. At such a time the age plus the approximate normal needs is a better guide in determining the immediate needs of the infant. It has been generally accepted that during the first two or three months 110 calories per kilo are needed, that from the third to the sixth month 100 calories suffice, and from the sixth to the twelfth month from 90 to 80 calories are needed. The demand for body growth on the proteids in the early months has been noted. This is calculated to amount to about 7 percent of the caloric need during the first year, or it may be even more since the utilization of cow's proteid is probably not as great as human.

In estimating the energy quotient of the different elements found in milk, Rubner's figures are accepted.

1 calorie is the amount of heat necessary to raise 1 liter of water to 1 degree Centigrade, and, according to Rubner,

1 gram of fat yields 9.3 calories,
1 gram of carbohydrates yields 4.1 calories,
1 gram of proteid yields 4.1 calories,
Or, if we wish to use ounces and quarts,
1 ounce of fat yields 288 calories,
1 ounce of carbohydrates yields 123 calories,
1 ounce of proteid yields 123 calories,
Or
1 percent of proteid in 1 ounce of mixture will yield 1.23 calories,
1 percent of carbohydrates in 1 ounce of mixture will yield 1.23 calories,
1 percent of fat in 1 ounce of mixture will yield 2.88 calories.

So that taking milk at 3.50 percent proteid, 4.75 percent carbohydrates, and 4 percent fat, we have about 20 calories to the ounce, or about 670 calories to the quart. Fat free milk or skimmed milk will yield about 400 calories per quart, while gravity cream (16 percent) will yield 860 calories per pint.

It will be apparent to any student of the subject that a complete understanding of an infant's needs cannot be met simply by supplying a sufficient number of calories irrespective of the quantity of each ingredient used. The physiologic capacity of the infant must be gauged, its power of assimilation studied and the particular individual element appreciated. In judging the powers of assimilation the stools are an important factor from two different standpoints; first of all, macroscopic, chemical and microscopic study must be carried out if we wish to know whether digestion is normal. The stools of a normal infant are one or two yellow, soft, homogeneous ones. If there is an excess of proteid, the stools are a brownish yellow color, with a cheesy odor, and have an alkaline reaction. Tough casein curds the size of kidney beans may appear which are insoluble in ether and are hardened by formalin. When there is an excess of starch in the food, the movements are a darker brown color, have an aromatic acid odor, and an acid reaction. This excess of starch tends to increase the bacterial fermentation and may produce the excessive scalding so often seen in intestinal fermentation with loose movements. Starch granules may also be found by chemical examination. The fat stools are pale gray, soft, slimy, or green with small soft curds which give the characteristic chemical reactions and pictures of neutral fat globules or fatty acid crystals or fatty soaps.

On the other hand, the importance of the intestinal flora and the influence of the different elements of food on their activity are only now becoming evident. In this the sugars undoubtedly play a big part and their balance with the proteid constituent is an important element in whether fermentative or putrefactive processes will predominate or whether the normal equilibrium will be maintained.

In order to accomplish these results with any assurance of success we must think of the different elements that enter into feeding in the most exact terms, which are percents. Otherwise our specialized knowledge will not carry us as far on the road to success as we are entitled to go. The processes in calculating these percents may be as simple or as complex as we wish to make them. The simpler we make them the more serviceable they will be, but the accuracy, and ability to get whatever percents of the various elements we need to meet the demands of each case must not be sacrificed to our ease in giving directions.

If we take cow's milk to be on the average fat 4.00 percent, sugar 4.75 percent and proteid 3.50 percent; and gravity cream to be fat 16 percent, sugar 4.50 percent, proteid 3.20 percent; fat-free or skimmed milk to be fat 0.0 percent, sugar 4.50 percent, proteid 3.20 percent, they will give us fairly constant and accurate averages in making up mixtures from the mixed milk of a good herd. If we wish to compute any desired formula the process is a very simple one and the necessary figures to remember are brought down to a minimum. Thus if we wish to feed a child ten months old, weighing 22 pounds, a mixture composed of 4 percent fat, 7 percent sugar and 1.50 percent proteid, 8 ounces at a feeding and 5 feedings in 24 hours, we would have the following example:

4/16 of 40 (ounces in total mixture) = 10 ounces of 15 percent cream would give 4 percent fat.

10 of 16 percent cream would also yield 10/40 of 3.20, the proteid in 16 percent cream or .80 percent of proteid.

10 ounces of 16 percent cream would also yield 10/40 of 4.50 sugar in 16 percent cream or 1.12 percent sugar. So that 10 ounces cream would furnish 4 percent fat, 1.12 percent sugar and 0.80 percent proteid, and this subtracted from the original amount wanted would give what was still needed or 0.0 percent.

$$\frac{4 = \text{percent of fat wanted}}{16 = \text{percent of cream used}} \text{ of } 40 = \text{ounces in total mixture.}$$

=10 ounces of 15 percent cream, which gives 4 percent fat.

10 ounces of 16 percent cream would also yield 10/40 of 3.20 (percent of proteid) in 16 (percent cream) or .80 percent proteid.

10 ounces of 16 percent cream would also yield 10/40 of 4.50 (percent of sugar in 16 percent cream) or 1.12 percent sugar, so that 10 ounces of cream would furnish 4 percent fat; 1.12 percent sugar; 0.80 percent proteid, and this subtracted from the original amount wanted would give what was still needed or fat 0.0 percent; 5.90 percent sugar; 0.70 percent proteid. .70 percent proteid is derived from the fat-free milk or skimmed milk which has a working percentage of

Fat 0.0 percent; sugar 4.50 percent; proteid 3.20 percent.

We need then

$$\frac{.70 \text{ (percent of proteid needed)}}{3.20 \text{ (percent of proteid in fat-free milk}} \text{ of } 40$$

= 8.75 ounces of fat-free milk.

8.75 ounces of fat-free milk contains not only .70 percent of proteid, but also

$$\frac{8.75 \text{ (ounces of fat-free milk)}}{40 \text{ (total quantity)}} \text{ of } 4.50 \text{ (percent of sugar in fat-free milk).}$$

=.97 percent sugar.

In 8.75 ounces of fat-free milk so far we have

Fat	Sugar	Proteid	
4 %	1.12	.80 %	from .10 oz. of 16 % cream
0	.97	.70	" 8.75 " " fat-free milk
4 %	2.09	1.50 %	18.75

5 percent of sugar is still needed, which can be obtained in the following way:

5 percent of 40 (total ounces in mixture) = .05 x 40 = 2 ounces of sugar of milk, or 4 tablespoons of sugar.

21.25 ounces of water is needed to bring up the total amount to the required 40 ounces.

The caloric value of this food would be figured as follows:

Mixture = 4–7–1.50 40 ounces = (1200 c.c.)
4 percent fat = .04 x9.3x1200 = 446.4 calories.
7 percent sugar = .07 x4.1x1200 = 344.4 calories.
1.5 percent sugar = .015x4.1x1200 = 73.8 calories.
Total, 864.6 calories.

The caloric need of an infant weighing 22 pounds in its tenth month would be about 85 calories per kilo or 850 calories. This mixture then would just about satisfy the caloric needs of this infant.

When whey mixtures are needed the same plan of computing the necessary amounts are carried out as follows:

Mixture wanted: Fat, Sugar, Proteid
3 6 90 whey
50 casein

40 oz. in total mixture.

Using 16 percent cream we have

3/16 of 40 = 7.5 ounces cream = 3 percent fat.

7.5 ounces of 16 percent cream furnishes $\frac{7.5}{40}$ of 3.20 (percent of proteid in 16 percent cream) = .60 proteid, and as 5/6 of this is casein we have the total amount of casein needed and .10 percent of whey is furnished.

We still need .80 (percent of whey proteid) of 40 which equals 32 ounces of whey.

7.5 ounces of cream + 32 ounces of whey = 39.5 ounces amount furnished by cream and whey.

$\frac{39.5}{40}$ of 4.50 (percent of sugar in whey and cream) = 4.50 percent sugar furnished, which leaves 1.5 percent of sugar still needed to complete the amount needed, which equals .015x40 = $\frac{6}{10}$ of an ounce of sugar or about 1 1/4 tablespoons of sugar of milk.

Therefore we have

Cream,	7.5 ounces.
Fat-free milk,	0.0 ounces.
Whey,	32.0 ounces.
Sugar,	1.25 tablespoonfuls.
Boiled water,	0.5 ounces.

The calories furnished by such a mixture would be:

From the cream, .03x9.3x1200(c.c.) = 335 calories
From the proteid and sugar, .074x4.1x1200(c.c.) = 364 calories
A total of 699 calories

The question of alkalinity has been a much discussed one but, as stated before, has been very much overestimated. The addition of lime water, besides acting as a mild alkali, stimulates the secretion of hydrochloric acid, so that when lime water is added the total amount of hydrochloric acid is increased and there is very little protective power from the lime water unless given in large proportions. The amount added should always be calculated with reference to the amount of cream and milk in the mixture and not with reference to the total amount of the mixture. The calculated maximum percent to produce a mild neutralization of the hydrochloric acid secreted by the stomach is 20 percent of the milk and cream, which delays the coagulation of the casein, giving a longer time for the protective action of the albuminoid portions of the proteid to affect some colloidal action on the casein, and so further delaying the coagulation and helping finally to a more rapid evacuation from the stomach because of the smaller size of the coagulum formed. A percentage of 50 to the amount of milk and cream suspends totally the action of the gastric digestion by hydrochloric acid and hastens the emptying of the stomach contents into the duodenum. Sodium bicarbonate acts even more strongly in neutralizing the hydrochloric acid, but exerts no stimulation on the hydrochloric acid secretion of the stomach. It requires 0.68 percent of the milk and cream used to facilitate this neutralization, and 1.70 percent to suspend all action of the hydrochloric acid on the proteid in the food, and so hasten the contents into the duodenum.

Sodium citrate appears to be the ideal protector of casein. For, as has been pointed out before, it has a definite protective action on the casein, being itself a stable colloidal substance with the power of protecting unstable colloids of the casein class, and sodium citrate also combines with hydrochloric acid to form sodium chlorid and so lessens the available hydrochloric acid. Two grams to the ounce of milk and cream used is needed to accomplish this, and double this amount in cases with hyperchlorhydria. For this same purpose a small percentage of gelatin, 1 to 2 percent of the amount of milk and cream in the mixture, can be used as also can decoctions of any of the cereal grains. These weak decoctions from barley, oats, rice, and other cereals contain the colloidal portions of the proteid in these grains without much of the starch. After the 6 months when, as has been seen, starch digestion begins to become useful, the cereal flours can be made use of and they will furnish a slight amount of nourishment, especially if used in the strength of 3 percent for the diluent in our mixtures, so serving a double purpose. They may act also mechanically in the aid of constipation when there is very little choice among the different cereals. The conversion of starch is first into dextrin and then into maltose. The assimilation of the different sugars varies greatly. Lactose (milk sugar) is the least convertible, whereas maltose is the most easily convertible into dextrose, the body sugar, forming two molecules of dextrose, while lactose is capable of forming but one of dextrose and one of galactose. It is not surprising then that the effect on weight is greater from the use of the more easily convertible and assimilable sugars, as cane and malt or even of starch. When prepared with this in view—which means careful dextrinization easily accomplished in an hour by the addition of takadiastase—its food value is increased in proportion to the amount of malt converted into dextrose. See Infant Feeding, Milk, etc.

MOLDS.—See Parasites (Vegetable).

MOLE.—1. A proliferative degeneration of the chorionic villi, producing a mass of berry-like vesicles attached to the placenta. It is called vesicular mole, and hydatidiform or myxomatous degeneration of the placenta. See Chorion. 2. Also applied to a small, pigmented spot of the skin. See Nevus.

MOLLITIES OSSIUM.—See Bone Diseases.

MOLLUSCUM CONTAGIOSUM.—An epithelial disease characterized by pinhead-sized to pea-sized or larger, smooth, semiglobular, waxy-white or pinkish elevations. The disease is uncommon.

Etiology.—The disease occurs chiefly in the children of the poorer classes. It is probably contagious.

Pathology.—The disease consists of an enormous hyperplasia of the cells of the rete mucosum, the process, in all probability, beginning in the hair follicles. The center of the molluscum tumor is made up of a number of lobules filled with ovoid or rounded, fatty looking, degenerated epithelial cells, designated as "molluscum bodies."

Symptoms.—The lesions are discrete, usually split-pea-sized, of the color of the skin or pinkish, with often a distinct waxy appearance. The summits are somewhat flattened, and contain a central, darkish opening, from which a cheesy secretion may be expressed. They are usually situated upon the face, particularly about the eyelids, cheeks, and chin. They increase slowly in size, eventually terminating in suppuration and disintegration. As a rule, no scarring is left. The lesions are few, a half dozen or more being the usual number present.

Diagnosis.—The characteristic features of the disease are: The size of the lesions; their waxy appearance; the presence of a central orifice giving exit to a whitish secretion; and the history and course of the affection.

Prognosis.—The condition sometimes disappears spontaneously. It is readily amenable to treatment.

Treatment.—The tumors may be destroyed by incision, expression of their contents, and cauterization of the cavity with the stick of nitrate of silver. Again, they may be curetted away or snipped off with a pair of curved scissors. Pedunculated growths may be ligated. When the lesions are small, the following ointment may be used:

℞.	Ammoniated mercury,	ʒ j
	Ointment of zinc oxid,	℥ j.

MONK'S-HOOD.—See Aconite.

MONOMANIA.—A form of mania or madness in which a single delusion or form of delusion is especially dwelt upon. See Mania, Paranoia.

MONOPLEGIA.—Paralysis of a single limb or of a single set of muscles. See Paralysis.

MONOTAL.—Guaiacol methylglycholate. It is said to have the action of guaiacol without being irritant or toxic. It is recommended as an analgesic for local application to painful areas of the skin, which readily absorbs it.

MONSEL'S SALT, and SOLUTION.—See Iron.

MONSTROSITY.—A teratism; a fetus or being with an abnormal development or superfluity or deficiency of parts or some vice of conformation. These may be compound or double, single or simple, according as the monster is composed of the malformations of one or more elementary organisms. A table of monstrosities is appended.

TABLE OF MONSTROSITIES.*

According to Geoffroy Saint-Hilaire, Altered by Hirst and Piersol.

HEMITERATA.

I. ANOMALIES OF VOLUME.
- A. Of Stature.
  - 1. *General diminution*, as in a dwarf—delayed growth.
  - 2. *General increase*, as in a giant—precocious development.

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* Reproduced from "Human Monstrosities," by Barton Cooke Hirst, M. D., and George A. Piersol, M. D., Philadelphia: Lea Brothers and Co., 1892.

B. Of Volume (strictly speaking).
1. *Local diminution*, affecting—
(*a*) *Regions*, as a limb.
(*b*) *Systems*, as undeveloped muscles.
(*c*) *Organs*, as small breasts, stenosis of canals, etc.
2. *Local increase*, affecting—
(*a*) *Regions*, as the head.
(*b*) *Systems*, as the adipose tissue.
(*c*) *Organs*, as large breasts in women, lactiferous breasts in men.

II. ANOMALIES OF FORM. *Single order*, including—deformed heads; anomalies of shape of the stomach; deformed pelves, etc

III. ANOMALIES OF COLOR.

A. *Deficiency*, complete, partial, or imperfect albinism.
B. *Excess*, complete, partial, or imperfect melanism.
C. *Alteration*, as in unusual color of the iris.

IV. ANOMALIES OF STRUCTURE.

A. *Deficiency in consistency*, as cartilaginous conditions of bones.
B. *Excess in consistency*, as anomalous ossification.

V. ANOMALIES OF DISPOSITION.

A. By Displacement.
1. *Of the splanchnic organs*, as anomalous direction of heart or stomach, hernias, exstrophy of the bladder, etc.
2 *Of the nonsplanchnic organs*, as club-foot, curvature of the spine, misplaced teeth, misplaced blood-vessels, etc.

B. By Change of Connection.
1. *Anomalous articulations*.
2. *Anomalous implantations*, as teeth out of line.
3. *Anomalous attachments*, as of muscles and ligaments.
4. *Anomalous branches*, as of arteries and nerves.
5. *Anomalous openings*, as of veins into the left auricle, of the ductus choledochus in an unusual situation, of the vagina into the rectum, of the rectum into the male urethra, of the rectum at the umbilicus, cloaca.

C. In Continuity.
1. *Anomalous imperforations*, as of rectum, vulva, vagina, mouth, esophagus.
2. *Anomalous union of organs*, as of kidneys, testicles, digits, teeth, ribs; adhesion of the tongue to the palate.

D. By closure, as in complete transverse septum in the vagina.

E. By Disjunction.
1. *Anomalous perforations*, as persistence of foramen ovale, ductus arteriosus, urachus.
2. *Anomalous divisions*, as splits, fissures in various organs, harelip, hypospadias, fissured tongue, cleft palate, fissured cheek.

VI. ANOMALIES OF NUMBER AND EXISTENCE.

1. *By numerical defect*, as absence of muscles, vertebræ, ribs, digits, teeth, a lung, a kidney, the uterus, the bladder, etc.
2. *By numerical excess*, as supernumerary digits, ribs, teeth, breasts, a double uterus.

HETEROTAXIS.

I. Splanchnic Inversion.
II. General Inversion.

HERMAPHRODITES.*

I. True Hermaphrodites.
(*a*) *Bilateral hermaphrodites*.
(*b*) *Unilateral hermaphrodites*.
(*c*) *Lateral hermaphrodites*.

II. Pseudohermaphrodites, with double sexual formation of the external genitals, but with unisexual development of the reproductive glands (ovaries and testicles).
(*a*) *Male pseudohermaphrodites* (with testicles).
1. *Internal pseudohermaphrodites*. Development of uterus masculinus.
2. *External pseudohermaphrodites*. External genitals approach the female type; the monstrosity presents a feminine appearance and build.
3. *Complete pseudohermaphrodites* (internal and external). Uterus masculinus with tubes; separate efferent canals for bladder and uterus.
(*b*) *Female pseudohermaphrodites* (with ovaries). Persistence of male sexual parts.
1. *Internal hermaphrodites*. Formation of vas deferens and tubes.
2. *External hermaphrodites*. Approach of the external genitals to the male type.
3. *Complete hermaphrodites* (internal and external). Masculine formation of the external genitals and of a part of the sexual tract.

MONSTERS.

CLASS I.—SINGLE MONSTERS.

Order I.—Autositic Monsters.

Genus I,	Species 1. *Ectromelus.*	Phocomelus Hemimelus Micromelus Ectromelus
	Species 2.	Symelus Uromelus Sirenomelus
Genus II,	Single species, *Celosoma.*	Aspalasoma Agenosoma Cyllosoma Schistosoma Pleurosoma Celosoma
Genus III,	Species 1. *Exencephalus.*	Notencephalus Proencephalus Podencephalus Hyperencephalus Iniencephalus Exencephalus
	Species 2. *Pseudencephalus.*	Nosencephalus Thlipsencephalus Pseudencephalus
	Species 3. *Anencephalus.*	Derencephalus Anencephalus
Genus IV,	Species 1. *Cyclocephalus.*	Ethmocephalus Cebocephalus Rhinocephalus Cyclocephalus Stomocephalus
	Species 2. *Octocephalus.*	Sphenocephalus Octocephalus Edocephalus Opococephalus Triocephalus

Order II.—Omphalositic Monsters.

Genus I,	Species 1. *Paracephalus.*	Paracephalus Omacephalus Hemiacephalus
	Species 2. *Acephalus.*	Acephalus Peracephalus Mylacephalus
	Species 3. *Asomata.*	

Genus II, Single species, *Anideus.*

CLASS II.—COMPOSITE MONSTERS.

Order I.—Double Autositic Monsters.*

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* Klebs' classification of hermaphrodites, as given by Ahlfeld, is substituted for that of Geoffroy Saint-Hilaire.

* The third order of Geoffroy Saint-Hilaire, single parasitic monsters, under which name he describes dermoid cysts, is omitted. Forster's classification is substituted, with slight modification, for that of Geoffroy Saint-Hilaire.

A. *Terata katadidyma.*
  Genus I, Diprosopus
  Genus II, Dicephalus
  Genus III, Ischiopagus
  Genus IV, Pygopagus
B *Terata anadidyma.*
  Genus I, Dipygus
  Genus II, Syncephalus
  Genus III, Craniopagus
C. *Terata anakatadidyma.*
  Genus I, Prosopothoracopagus
  Genus II, Omphalopagus
  Genus III, Rhachipagus

ORDER II.—DOUBLE PARASITIC MONSTERS.

- Genus I,
  - Species 1. *Heterotypus.*
    - Heteropagus
    - Heterodelphus
    - Heterodymus
    - Heterotypus
    - Heteromorphus
  - Species 2. *Heteralius.* Epicomus
- Genus II,
  - Species 1. *Polygnathus.*
    - Epignathus
    - Hypognathus
    - Paragnathus
    - Augnathus
  - Species 2. *Polymelus.*
    - Pygomelus
    - Gastromelus
    - Notomelus
    - Cephalomelus
    - Melomelus
- Genus III, *Endocyma*.........
  - Dermocyma
  - Endocyma

ORDER III.—TRIPLE MONSTERS.

MORBILLI.—See MEASLES.

MORPHEA.—Circumscribed scleroderma; Addison's keloid; the most common form of scleroderma, usually occurring in young female adults. Its usual seats are about the breasts and the face and neck, and often it follows the course of the nerve distribution. It occurs in the form of patches—rounded, ovoid, or irregular in outline; small or large, soft or firm, smooth or shining, pale yellowish or brownish in color. The lesions are, as a rule, asymmetric. The course of the disease is chronic; it may also manifest itself in the form of atrophic, pit-like depressions in the skin, and as lines, streaks, and telangiectases.

MORPHIN.—$C_{17}H_{19}NO_3$. The name of the principal alkaloid of opium, to which the properties of that drug are chiefly due. It is an anodyne, hypnotic, and narcotic. One-fourth of a grain corresponds in activity with 1 grain of opium of average strength. See OPIUM.

Preparations.—**M. Acetas,** soluble in water. Dose, 1/8 to 1/2 grain. **M. Hydrochlorid** occurs in silky crystals, soluble in water. Dose, 1/8 to 1/2 grain. **M., Pulv., Comp.,** Tully's powder, contains morphin sulphate 1 1/2, camphor, 32, licorice 33, and calcium carbonate, 33 1/2 parts. Dose, 5 to 15 grains. **M. Sulphas,** acicular crystals, soluble in hot water. Dose, 1/8 to 1/2 grain.

MORRHUÆ OLEUM.—See COD-LIVER OIL.

MORTALITY.—See DEATH-RATE; LIFE (Expectation).

MORTON'S DISEASE.—See METATARSALGIA.

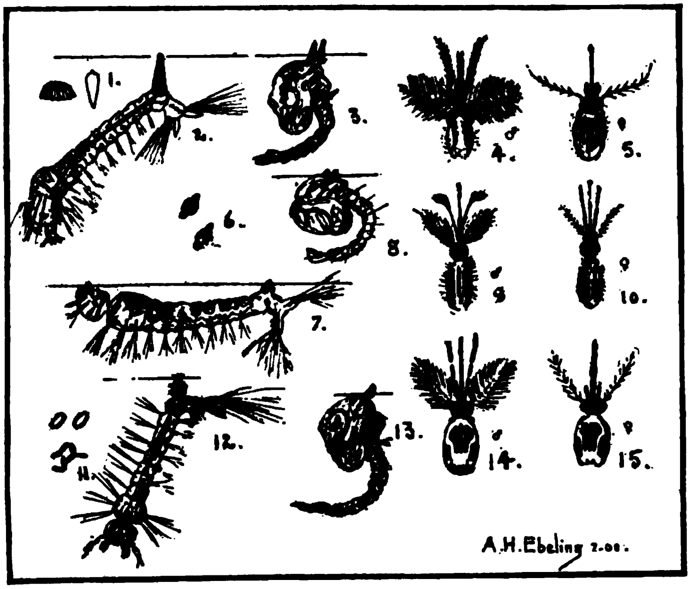
MORVAN'S DISEASE (Analgic Panaritium).—A disease characterized by disorders of sensations of pain, temperature and touch, and painless felons. Probably this disease is identical with syringomyelia in most instances. In some cases it is leprosy.

MOSCHUS.—See MUSK.

MOSQUITOS.—There are three varieties which are of medical interest, Culex, Stegomyia, and Anopheles. The following table (by Jackson) will be found helpful:

	CULEX.	STEGOMYIA.	ANOPHELES.
Diseases conveyed.	Mostly nonpathogenic for man but may convey filarial diseases.	Stegomyia fasciata conveys yellow fever in man.	Conveys malarial disease. Conveys filarial disease in man.
Breeds...	In and about houses, gardens, back yards, old flower pots, or tins, vessels, tubs, cisterns, barrels, gutters, drains. "Home bred"	Resembles Culex.	Puddle breeding—shallow, small pools, in rock or soil, also at margins of lakes and rivers, quiet bays, ponds, in rice fields and water covering submerged grass. Less "home bred."
Bites....	By day or night—at twilight. Females only.	Often bites by day. Females only.	Nocturnal chiefly. Females only.
Wings...	Rarely spotted..	Never spotted .	Usually spotted. There are a few exceptions.
Larval motility.	Larvæ float with heads downward. When disturbed wriggle to bottom of vessel.	Resemble Culex.	Float at surface of water like sticks and have a backward, skating motion.
Resting posture	"Hunch-backed." Axis of head and proboscis forms an obtuse angle with body.	Resembles Culex.	Axis of head, proboscis and body in same line. Appears as if standing on its head. Some exceptions to this rule.
Eggs....	Deposited in ellipse-shaped masses, convex below, concave above (boat shaped). Eggs arranged in rows, perpendicular and adherent, have one pointed end. Color dirty white. 200 to 400 in a batch.	Eggs are more oval and are not deposited in rafts or masses. Float singly upon their sides, or sink, hatching submerged.	Deposited in masses of 40 to 100 eggs, not adherent, each egg floating on its side, and regularly elliptic in outline, at middle of each side appears a clasping wrinkled membrane. Dark in color.
Singing tone	High pitched....	Resembles Culex.	Low pitched.
Bodies ..	Dull gray in color.	Body and legs covered with black scales and white markings in spots or lines. S. Fasciata has transverse striations on ventral aspect of body.	Dark gray or brown.

Destruction.—The most rational method of procedure is to aim at the extermination of these insects by destroying all larvæ through drainage, ditching and leveling of their breeding places and especially by covering these places with kerosene. The adult insects may be killed by disinfection (especially with sulphurous acid) of rooms and clothing, etc., in which they lurk. See DISINFECTION.



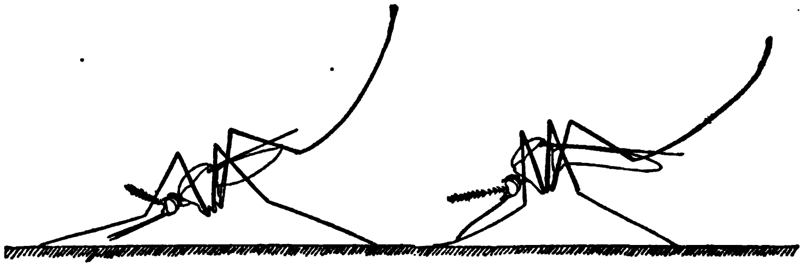
METAMORPHOSIS OF MOSQUITOS.
1, 2, 3, 4 and 5. Eggs, larva, pupa and heads of male and female Culex; 6, 7, 8, 9 and 10, eggs, larva, pupa and heads of male and female Anopheles; 11, 12, 13, 14, and 15, eggs, larva, pupa and heads of male and female Stegomyia.—(*Stitt.*)

To Keep Mosquitos Away.—Howard recommends the following to keep mosquitos from one while asleep:

℞. Oil of citronella, } each ℥i
Spirit of camphor, }
Oil of cedar, ʒss.

Mix and apply a few drops on pillow and on a towel near the head of the bed.

Mosquitos do not like the smell of: Spirit of camphor, oil of peppermint, oil of pennyroyal, oil of lavender, oil of hedeoma, oil of erigeron, cade oil.



ANOPHELES. CULEX.
RESTING POSITIONS OF ANOPHELES AND CULEX INSECTS.—(*Stitt.*)

Another preparation is:

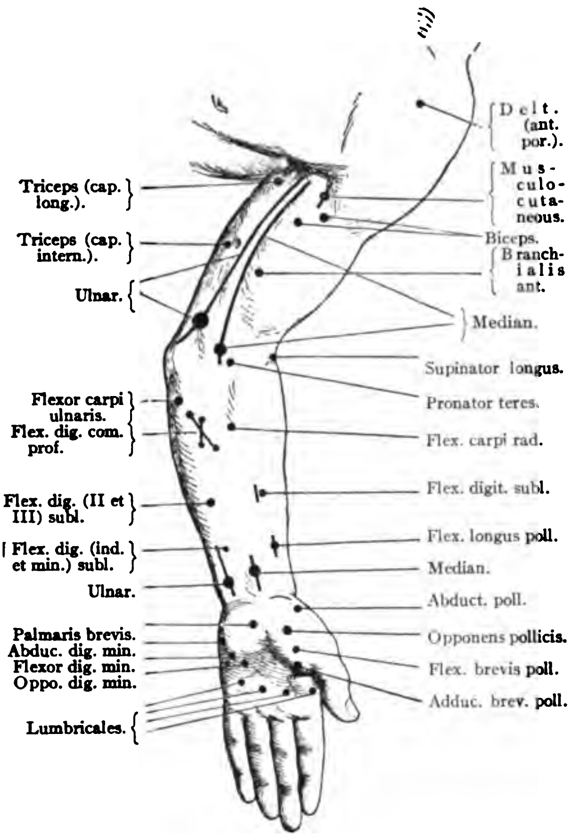
℞. Oil of lavender, }
Alcohol, } equal parts.
Castor oil. }

Mix and apply on face and hands and sprinkle a few drops on a towel hung at the head of the bed.

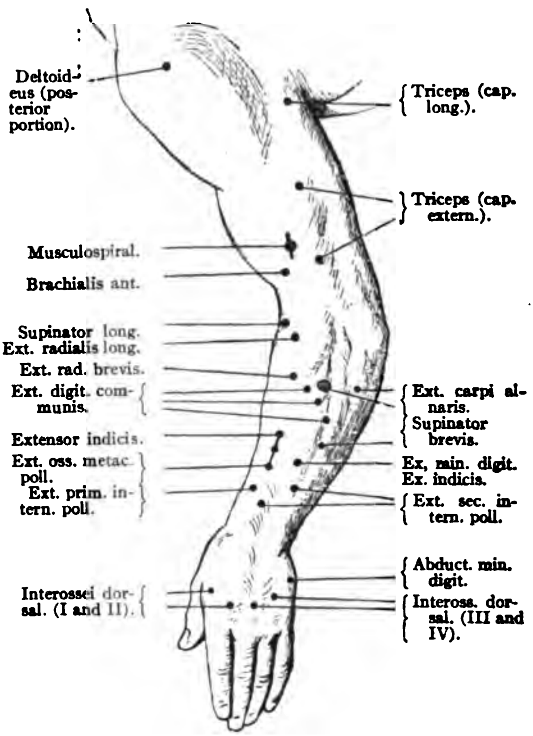
For Mosquito Bites.—Apply plain soap to the bitten places; other remedies used are: alcohol, ammonia, bichlorid of mercury, calcium chlorid, glycerin, indigo, ichthyol, potassium hydroxid (10 percent solution), potassium permanganate, phenol, naphthalin, salicylic acid.

See FILARIARIS, MALARIAL FEVERS, YELLOW FEVER.

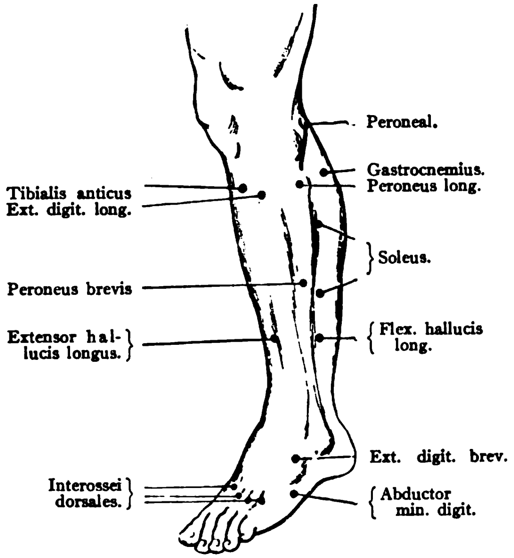
MOTOR POINTS.—The points on the surface of the body where the various branches of the motor nerves supplying the muscles may be affected by electricity. See ELECTRICITY, DEGENERATION (Reaction), MUSCLES, etc. The accompanying illustrations show the principal motor points:



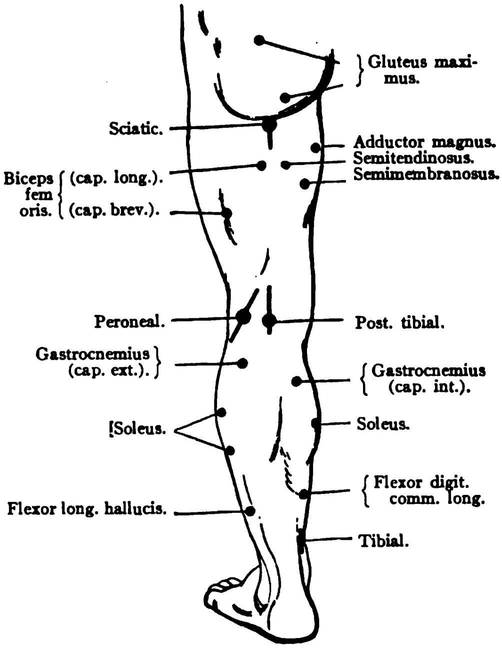
Motor Points of Palmar Aspect of Left Arm.



Motor Points of Dorsal Aspect of Left Arm.



Motor Points of Outer Aspect of Left leg.

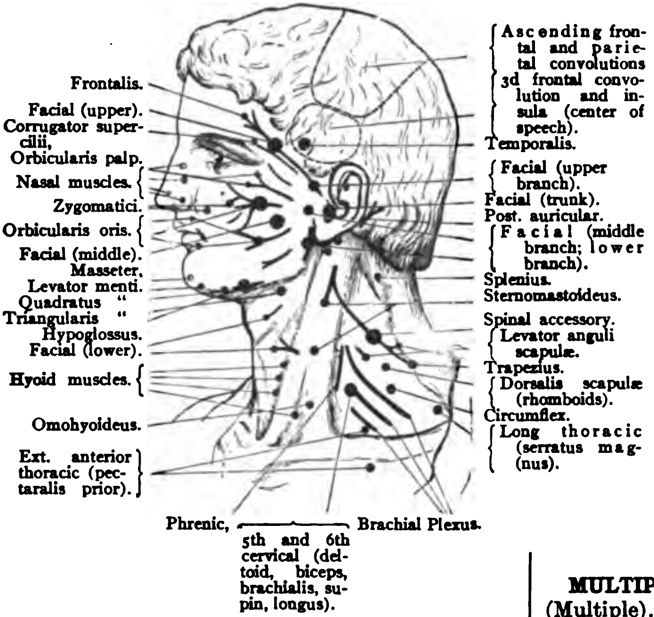


Motor Points of Posterior Aspect of Left Thigh and Leg.

MOUNTAIN SICKNESS.—A condition resulting from excessive exertion at high altitudes characterized by rapid pulse, dyspnea, epistaxis, slight rise of temperature and intense fatigue on exertion.

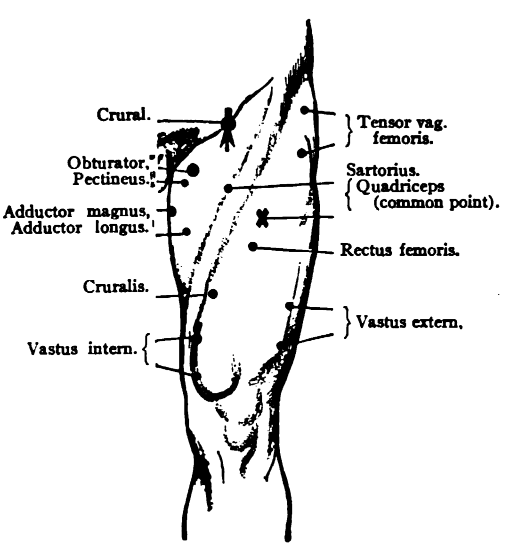
MOUNTING.—See Pathologic Technic.

MOUTH, Diseases.—See Stomatitis.



Motor Points of Face and Neck.

MUCOUS PATCHES.—These are papules deprived of epithelium, a frequent lesion of acquired secondary and of inherited syphilis. They are associated with papular eruptions in early secondary syphilis. They are situated usually on mucous membranes, or on thin and moist skin, are gray in color, are circular or oval, moist, and excrete an offensive and virulent discharge, which is highly contagious. They appear as areas of congestion, swelling, and abrasion of the epidermis upon the lips, palate, gum, tongue, cheeks, vagina, vulva, scrotum, anus, and under the prepuce, and are often accompanied by some fissuring and ulceration of the adjacent parts.



Motor Points of Anterior Aspect of Left Thigh.

The treatment requires scrupulous attention to cleanliness of the affected region, applications of solid silver nitrate or copper sulphate, and frequent dusting with calomel powder. They may be touched with blue stone every day, at the same time employing an astringent mouth-wash. If the areas proliferate, they should be excised or burned. Growing papules may be cauterized with chromic acid (1 : 5), or nitric or carbolic acids may be used as caustics. A solution of zinc chlorid, 10 grains to the ounce, makes a good astringent dressing for after-treatment. General treatment must be carried out at the same time. See Syphilis.

A mouth-wash:

℞.	Boroglycerid,	℥ ss
	Water,	℥ viij.

Use as a mouth-wash several times daily.

MULTIPLE IMPREGNATION.—See Pregnancy (Multiple).

MULTIPLE NEURITIS.—See Neuritis (Multiple).

MULTIPLE SEROSITIS.—An extensive inflammation of serous membrane with primary seat in the pericardium, peritoneum or pleura, characterized by ascites and sometimes edema of the extremities. It is probably due to an organism of low virulence. The pathology and symptoms vary with the seat of invasion. If perihepatitis is primary, Glisson's capsule has the appearance of icing.

Associated with the ascites may be found pleurisy and pericarditis. The affection develops slowly and insidiously. The patient gradually loses strength and death ultimately ensues from exhaustion. Treatment is symptomatic.

MUMPS (Epidemic Parotitis).—An acute contagious disease, manifested locally by swelling and inflammation of the parotid and, rarely, of the other salivary glands.

Etiology.—While probably of microbic origin, the specific organism has not been established.

Mumps is highly contagious, and is usually communicated by the breath or exhalations, but may be carried by a third person or by fomites. Those between the ages of 10 and 14 are the most susceptible. Sporadic cases are sometimes observed. It is most likely to be communicated during the beginning of the attack, but possibly while the febrile symptoms remain. One attack usually gives immunity, but if only one of the parotids has been affected during the first attack, the other may be involved subsequently.

Pathology.—Parotitis begins as a catarrhal inflammation of the ducts, involving later the periglandular connective tissue. The inflammation is seldom of such a nature as to cause suppuration.

Symptoms.—The period of incubation is 10 to 20 days; about 14 days, usually. The invasion is marked by languor and fever (101° to 103° F.), with perhaps headache and vomiting. The patient complains of pain at the angle of the jaw, which is greatly increased on swallowing an acid, such as vinegar. With these symptoms is noticed a swelling of the parotid gland on one side, the one on the opposite side usually soon becoming also involved. Occasionally but one of the glands is affected, and in other cases both may show the swelling at the same time. The swelling increases gradually until the third to sixth day, and produces marked disfigurement, filling the depression beneath the ear and extending to the cheek and neck. The most prominent point is just below the lobe of the ear, causing it to be pressed outward. The salivary glands are usually also involved, and the mouth, as a rule, is dry, although in some cases there is marked salivation. When the swelling has reached its height, the pressure on the adjacent tissues causes a disagreeable feeling of tension; chewing, swallowing, and even speaking are painful and difficult. Ringing in the ears and earache are quite common. As a rule, the patient is not seriously ill, but in some cases the fever is high, and there may be nervous symptoms, such as headache or delirium.

The duration of the attack is about a week, after which the swelling subsides, and by the tenth or twelfth day entirely disappears.

Complications and Sequels.—Mumps usually runs a mild course, without any serious symptoms, but occasionally complications arise which add greatly to the severity of the disease. The most common complications are orchitis in the male, and, much less frequently, mastitis, ovaritis, or vulvovaginitis in the female. These inflammations usually occur in those who have reached puberty, seldom being seen in children, and usually do not appear until the swelling in the glands of the neck has subsided. These complications lengthen the course of the attack and increase the constitutional symptoms, but in most cases recovery without serious trouble occurs.

Among the less common complications and sequels are otitis media and deafness, meningitis, arthritis, and albuminuria.

Prognosis.—In the great proportion of cases mumps is a mild disease, recovery taking place in a few days.

Diagnosis.—Parotitis is most likely to be confounded with acute swelling of the cervical lymph-glands. In a parotid swelling the lobe of the ear is near the center of the enlargement, while that of a lymph-node is below the ear and behind the jaw, never extending upon the face. The throat symptoms in acute tonsillitis, diphtheria, or scarlet fever would prevent the swollen neck in these diseases from being mistaken for mumps.

Treatment.—Cases of mumps occurring in schools or institutions and in private practice, when there are susceptible persons in the family, should be quarantined for 3 weeks. The patient should be confined to one room, and when the symptoms are at all severe, should be in bed during the disease, as the danger of complications is much increased when the patient is allowed to run about. The diet should be restricted to milk and light broths. The bowels should be acted upon by small doses of calomel (1/12 to 1/6 grain every 2 hours), after which the following mixture may be given:

℞. Antimony and potassium tartrate,	gr. j
Magnesium sulphate,	ʒ iv.
Spirit of nitrous ether,	ʒ iij
Syrup,	℥ j
Water,	q. s. ℥ iv.

A teaspoonful every 3 or 4 hours.

For the pain, restlessness, or nervous symptoms, 1 to 3 grains of phenacetin should be given every 3 or 4 hours. The nose and mouth should be sprayed and washed 3 or 4 times a day with a weak Dobell's solution or with any alkaline mouth-wash. Ichthyol ointment (10 percent) or belladonna ointment should be applied to the gland if it is painful, and it should be supported by a bandage and absorbent cotton. For the anemia which quite often follows an attack of mumps, there should be given iron, codliver oil, etc. For the treatment of orchitis, see TESTICLE.

MURMURS, CARDIAC.—Any one of those adventitious sounds produced by the abnormal passage of blood through the cavities and orifices of the heart or by perverted cardiac action. The names given to these murmurs correspond with the period of the cardiac cycle in which they occur. A murmur that occurs in the period of auricular systole is termed presystolic or auricular systolic; one that occurs in the period of ventricular systole, systolic; one that occurs during the diastole of the ventricles, diastolic; and should the murmur immediately follow the first or second sound, postsystolic or postdiastolic respectively. In relation to their seat of generation cardiac murmurs are designated mitral, aortic, tricuspid, and pulmonary. All murmurs should be timed by the carotid pulse, not by their relation to the apex-beat. Murmurs are most frequently caused by some change in one of the cardiac valves or orifices, allowing of a reflux of the blood or obstructing its onward progress. See HEART-DISEASE (Organic).

TABLE OF ORGANIC ENDOCARDIAL MURMURS.

NAME, IN ORDER OF FREQUENCY.	TIME.	SITE OF MAXIMUM INTENSITY.	LINE OF CONDUCTION.	DIRECT OR INDIRECT.	BASIC OR APICAL.	LESION.	QUALITY.
Mitral regurgitant.	Systolic...	Center of mitral area, above and to left of apex.	At sixth rib opposite apex, a line drawn from the anterior fold of axilla to lower angle of left scapula.	Indirect mitral.	Apical.	Mitral insufficiency or incompetence	Variable; usually soft, blowing, bellows; may be distinctly musical.
Aortic obstructive.	Systolic...	Midsternum or to right of it, opposite third rib or second interspace.	Toward top of sternum, and along aorta and its large branches.	Direct aortic.	Basic...	Aortic obstruction or constriction.	Usually loud and harsh. Harshness is one of its distinguishing characteristics.
Aortic regurgitant.	Diastolic...	Midsternum opposite upper border of cartilage of third rib.	Down sternum to ensiform cartilage.	Indirect aortic.	Basic...	Aortic insufficiency or incompetence.	Soft, blowing, sometimes rough, frequently musical. It has the greatest area of diffusion of all the cardiac murmurs.
Mitral obstructive.	Presystolic.	Over mitral area around the apex.	Usually not transmitted.	Direct mitral.	Apical..	Mitral obstruction or constriction.	Generally low-pitched, rough, churning, grinding, or blubbering. Subject to great variation of pitch and quality.
Tricuspid regurgitant.	Systolic...	Midsternum just above the ensiform cartilage.	Toward the epigastrium.	Indirect tricuspid.	Apical.	Tricuspid insufficiency or incompetence.	Low-pitched, superficial, blowing, soft, faint.
Tricuspid obstructive.	Presystolic.	Midsternum opposite the cartilage of fourth rib.	Not transmitted...	Direct tricuspid.	Apical..	Tricuspid obstruction or constriction.	Undetermined.
Pulmonary obstructive.	Systolic...	Second interspace to the left of sternum or at the level of third rib.	Upward a short distance and to left of sternum, stopping abruptly.	Direct pulmonary.	Basic...	Pulmonary obstruction or constriction.	Often harsh and audible over the whole precordia; may be very faint; at times bellows.
Pulmonary regurgitant.	Diastolic .	Second left interspace.	Down left edge of sternum to ensiform cartilage.	Indirect pulmonary.	Basic...	Pulmonary insufficiency or incompetence.	Soft and blowing.

MUSCÆ VOLITANTES.—Strings of nucleated rings or dots which float before the eye, and in some conditions, such as high myopia, are so numerous that they cannot be ignored, and cause considerable disturbance of vision. The origin of muscæ is not exactly understood. Examination of the muscæ is of interest, and they can be best studied by lying on the back and looking at a bright cloud in the sky. By what is called ocular **ballottement**—turning the eye downward and arresting the movement very sharply and suddenly—one may get a rebound of muscæ from the bottom of the chamber up to the line of visual perception. While probably of no pathologic import, many patients drift from one oculist to another in the hope of relief. In such a case any existing ametropia or muscular imbalance should be corrected, and strict hygiene of the eyes advised. Very often these patients are sufferers from excessive uric acid formation, and are much relieved by a continued course of salines, such as phosphate of sodium or other antiuric-acid remedies. The diet should be carefully regulated and outdoor exercise insisted upon.

MUSCLES, TABLE OF PRINCIPAL.

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Abductor hallucis	Outer head of os calcis, plantar fascia, intermuscular septum: inner head, internal annular ligament, and tendon of tibialis posticus.	Inner portion of lower surface of base of great toe and inner side of internal sesamoid bone.	Internal plantar division of posterior tibial nerve.	Flexes and abducts first phalanx of great toe.
Abductor longus pollicis.	See *Extensor ossis meta-*	*carpi pollicis.*		
Abductor minimi digiti manus.	Pisiform bone	First phalanx of the little finger.	Ulnar	Abducts little finger.
Abductor minimi digiti pedis.	Outer tuberosity of the os calcis and plantar fascia.	First phalanx of the little toe.	External plantar	Abducts little toe.
Abductor ossis metatarsi quinti.	Outer tubercle of calcaneum.	Tuberosity of base of 5th metatarsal bone.	External plantar	Abducts little toe.
Abductor pollicis manus.	Trapezium, scaphoid, annular ligament, palmar fascia.	First phalanx of thumb.	Median	Abducts and flexes first phalanx of thumb.
Abductor pollicis pedis.	Inner tuberosity of the os calcis.	First phalanx of great toe.	Internal plantar	Abducts great toe.
Accelerator urinæ	Central tendon of perineum and median raphe.	Bulb, spongy and cavernous parts of penis.	Perineal.	Ejects urine.
Adductor brevis	Ramus of pubes	Upper part of the linea aspera of femur.	Obturator	Adducts, rotates externally, and flexes thigh.
Adductor hallucis	Tarsal ends of the three middle metatarsal bones.	Base of the first phalanx of great toe.	External plantar	Adducts great toe.
Adductor longus	Front of pubes	Middle of linea aspera of femur.	Obturator	Adducts, rotates outward, and flexes thigh
Adductor magnus	Rami of pubes and ischium.	All of the linea aspera of femur.	Obturator and great sciatic.	Adducts thigh and rotates it outward.
Adductor minimus	A name given to the upper portion of the adductor magnus.			
Adductor pollicis	Third metacarpal	First phalanx of thumb.	Ulnar	Draws thumb to median line.
Anconeus	Back of external condyle of humerus.	Olecranon process and shaft of ulna.	Musculospiral	Extends forearm.
Attollens aurem	Occipitofrontalis aponeurosis.	Pinna	Temporal branch of facial.	Elevates pinna.
Attrahens aurem	Lateral cranial aponeurosis.	Helix	Facial	Advances pinna.
Azygos uvulæ	Posterior nasal spine of palate bone.	Uvula	Facial through sphenopalatine ganglion.	Raises uvula.
Biceps	1. Long—Glenoid cavity. 2. Short—Coracoid process.	Tuberosity of radius	Musculocutaneous	Flexes and supinates forearm.
Biceps femoris	1. Ischial tuberosity. 2. Linea aspera.	Head of fibula and outer tuberosity of head of fibula.	Great sciatic and external popliteal.	Flexes and rotates leg outward.
Biventer cervicis	Transverse processes, 2–4 upper dorsal vertebræ.	Superior curved line of occipital bone.	(Portion of complexus.)	Retracts and rotates head.
Brachialis anticus	Lower half of the shaft of humerus.	Coronoid process of ulna.	Musculocutaneous, musculospiral.	Flexes forearm
Brachioradialis	See *Supinator longus.*			

MUSCLES, TABLE OF PRINCIPAL.

Name.	Origin.	Insertion.	Innervation.	Function.
Buccinator	Alveolar process of maxillary bones and pterygomaxillary ligament.	Orbicularis oris	Facial, buccal branch.	Compresses cheeks, retracts angle of mouth.
Bulbocavernous	See *Accelerator urinæ*.			
Cervicalis ascendens	Angles of five upper ribs	Transverse processes of 4th, 5th, and 6th cervical vertebræ.	Branches of cervical	Keeps head erect.
Ciliary	*Longitudinal* portion (Brücke's m.), junction of cornea and sclera; *circular* portion (Müller's m.), fibers form a circle.	Outer layers of choroid	Ciliary	The muscle of visual accommodation.
Coccygeus	Ischial spine	Coccyx, sacrum, and sacrococcygeal ligament.	Sacral	Supports coccyx, and closes pelvic outlet.
Complexus	Transverse processes 7th cervical and 6 upper dorsal, and articular processes of 3d to 6th cervical.	Occipital bone	Suboccipital, great occipital, and branches of cervical.	Retracts and rotates head.
Compressor narium	Nasal aponeurosis	Fellow muscle and canine fossa	Facial	Dilates nostril.
Compressor narium minor.	Alar cartilage	Skin at end of nose	Facial	Dilates nostril.
Compressor urethræ	Ramus of pubes	Fellow muscle	Perineal	Compresses membranous urethra.
Compressor vaginæ	The analogue of the two bulbocavernosi of the male.		Perineal	Compressor of vagina.
Constrictor of pharynx (inferior).	Cricoid and thyroid cartilages.	Pharyngeal raphe	Glossopharyngeal, pharyngeal plexus and external laryngeal.	Contracts caliber of pharynx.
Constrictor of pharynx (middle).	Cornua of hyoid and stylohyoid ligament.	Pharyngeal raphe	Glossopharyngeal and pharyngeal plexus.	Contracts caliber of pharynx.
Constrictor of pharynx (superior).	Internal pterygoid plate, pterygomax. lig., jaw and side of tongue.	Pharyngeal raphe	Glossopharyngeal and pharyngeal plexus.	Contracts caliber of pharynx.
Coracobrachialis	Coracoid process of scapula.	Inner surface of shaft of humerus.	Musculocutaneous	Adducts and flexes arm.
Corrugator supercilii.	Superciliary ridge of frontal bone.	Orbicularis palpebrarum.	Facial	Draws eyebrow downward and inward.
Cremaster	Upper and deep surface of middle of Poupart's ligament.	Spine and crest of pubic bone and fascia propria.	Genital branch of genitocrural.	Elevates testicle.
Crureus	See *Vastus internus*.			
Deltoid	Clavicle, acromion, and spine of scapula.	Shaft of humerus	Circumflex	Abducts humerus.
Depressor alæ nasi	Incisive fossa of superior maxillary bone.	Septum and ala of nose.	Facial, buccal branch.	Contracts nostril.
Depressor anguli oris.	External oblique line of inferior maxillary bone.	Angle of mouth	Facial, supramaxillary branch.	Depresses angle of mouth.
Depressor labii inferioris.	External oblique line of the inferior maxillary bone.	Lower lip	Facial, supramaxillary branch.	Depresses lip.
Depressor urethræ	Ramus of ischium near deep transversus perinei.	Fibers of constrictor vaginæ muscle.		

MUSCLES, TABLE OF PRINCIPAL.

Name.	Origin.	Insertion.	Innervation.	Function.
Detrusor urinæ	Front of pubes	Prostate (in male), vagina (in female).	Sympathetic	Compresses bladder.
Diaphragm	Ensiform cart., 6 or 7 lower ribs, ligamenta arcuata, bodies of lumbar vertebræ.	Central tendon	Phrenic and sympathetic.	Respiration and expulsion.
Digastric (anterior belly).	Inner surface of inferior maxillary bone, near symphysis.	Hyoid bone	Inferior dental	Elevates hyoid and tongue.
Digastric (posterior belly).	Digastric groove of mastoid process.	Hyoid bone	Facial	Elevates hyoid and tongue.
Dilator naris anterioris.	Alar cartilage	Border of ala of nose	Facial, infraorbital branch.	Dilates nostril.
Dilator naris posterioris.	Nasal notch of superior maxillary bone.	Skin at margin of nostril.	Facial, infraorbital branch.	Dilates nostril.
Dorsal interossei, 4	Sides of metacarpal bones.	Bases of corresponding phalanges.	Ulnar	Abduct fingers from median line.
Dorsal interossei, 4	Sides of metatarsal bones.	Base of first phalanx of corresponding toe.	External plantar	Abduct toes.
Erector clitoridis	Tuberosity of ischium	Each side of crus of clitoris.		Erects clitoris.
Erector penis	Ischial tuberosity, crus penis, and pubic ramus.	Tunica albuginea of corpus cavernosum.	Perineal	To maintain erection.
Erector spinæ	Iliac crest, back of sacrum, lumbar, and three lower dorsal spines.	Divides into sacrolumbalis, longissimus dorsi, and spinalis dorsi.	Lumbar nerves, posterior division.	Extension of lumbar spines on pelvis.
Extensor brevis digitorum pedis.	Os calcis, externally	First phalanx of great toe and tendons of extensor longus.	Anterior tibial	Extends toes.
Extensor brevis hallucis.	A name applied to that portion of the extensor brevis digitorum that goes to the great toe.			
Extensor brevis pollicis.	See *Extensor primi inter*	*nodii pollicis.*		
Extensor carpi radialis brevior.	External condyloid ridge of humerus.	Base second and third metacarpal.	Posterior interosseous.	Extends wrist.
Extensor carpi radialis longior.	Lower ⅓ external condyloid ridge of humerus.	Base of second metacarpal.	Musculospiral	Extends wrist.
Extensor carpi ulnaris.	1*st head*, external condyle of humerus. 2*d head*, posterior border of ulna.	Base of fifth metacarpal.	Posterior interosseous.	Extends wrist.
Extensor coccygis	Last bone of sacrum or first of coccyx.	Lower part of coccyx	Sacral branches	Extends coccyx.
Extensor communis digitorum.	External condyle of humerus.	All of the second and third phalanges.	Posterior interosseous.	Extends fingers.
Extensor indicis	Back of ulna	Second and third phalanges of index finger.	Posterior interosseous.	Extends index.
Extensor longus digitorum pedis.	Outer tuberosity of tibia and shaft of fibula.	Second and third phalanges of toes.	Anterior tibial	Extends toes.
Extensor longus pollicis.	See *Extensor secundi in*	*ternodii pollicis.*		
Extensor minimi digiti.	External condyle of humerus.	Second and third phalanges of little finger.	Posterior interosseous.	Extensor of little finger.

MUSCLES, TABLE OF PRINCIPAL.

Name.	Origin.	Insertion.	Innervation.	Function.
Extensor ossis metacarpi pollicis.	Back of radius and ulna and interosseous membrane.	Base of metacarpal of thumb and fascia.	Posterior interosseous.	Extends thumb.
Extensor primi internodii pollicis.	Back of radius...........	Base of first phalanx of thumb.	Posterior interosseous.	Extends thumb.
Extensor proprius digiti minimi.	Lower part of ulna, or posterior ligament of wrist-joint.	Base of first phalanx of little finger.		
Extensor proprius hallucis.	Middle of fibula..........	Base of last phalanx of great toe.	Anterior tibial.......	Extends great toe.
Extensor secundi internodii pollicis.	Back of ulna............	Base of last phalanx of thumb.	Posterior interosseous.	Extends thumb.
Flexor accessorius digitorum pedis (2 *heads*).	1. Inner; 2. Outer surface of os calcis.	Tendon of flexor longus digitorum.	External plantar.....	Accessory flexor of toes.
Flexor accessorius longus digitorum pedis.	Shaft of tibia or fibula....	Tubercle of os calcis, and joins tendon of long flexor.	External plantar.....	Assists in flexing toes.
Flexor brevis digitorum pedis.	Inner tuberosity of os calcis and plantar fascia.	Second phalanges of the lesser toes.	Internal plantar......	Flexes lesser toes.
Flexor brevis hallucis.	Under surface of cuboid, plantar ligaments, and external cuneiform.	Base of first phalanx of great toe.	Internal plantar......	Flexes and slightly adducts first phalanx of great toe.
Flexor brevis minimi digiti manus.	Unciform bone and annular ligament.	First phalanx of little finger.	Ulnar...............	Flexes little finger.
Flexor brevis minimi digiti pedis.	Base of fifth metatarsal...	Base of first phalanx of little toe.	External plantar.....	Flexes little toe.
Flexor brevis pollicis manus.	2 heads—*outer:* lower border of anterior annular ligament; ridge of trapezium; *inner:* os magnum, and bases of first, second, and third metacarpal bones.	Base of first phalanx of thumb.	*Outer head*—median, palmar branch. *Inner head*—deep ulnar.	Flexes metacarpal bone of thumb.
Flexor brevis pollicis pedis.	See *Flexor brevis hallucis.*			
Flexor carpi radialis.	Internal condyle of humerus.	Metacarpal bone of index finger.	Median.............	Flexes wrist.
Flexor carpi ulnaris (2 *heads*).	1. Internal condyle. 2. Olecranon and ulna.	5th metacarpal, annular lig. and pisiform bone.	Ulnar...............	Flexes wrist.
Flexor longus digitorum pedis.	Shaft of tibia............	Last phalanges of toes..	Posterior tibial.......	Flexes phalanges and extends ankle.
Flexor longus hallucis	Lower two-thirds of shaft of fibula.	Last phalanx of great toe.	Posterior tibial.......	Flexes great toe.
Flexor longus pollicis.	Shaft of radius and coronoid process of ulna.	Last phalanx of thumb.	Anterior interosseous.	Flexes the thumb.
Flexor profundus digitorum.	Shaft of ulna............	Last phalanges by four tendons.	Ulnar and anterior interosseous.	Flexes the phalanges.
Flexor sublimis digitorum (3 *heads*).	1. Inner condyle. 2. Coronoid process. 3. Oblique line of radius.	Second phalanges by four tendons.	Median............	Flexes second phalanges.
Gastrocnemius (2 *heads*).	Condyles of femur........	Os calcis by tendo Achillis.	Internal popliteal....	Extends foot.
Gemellus inferior....	Tuberosity of ischium and lesser sacro-sciatic notch.	Great trochanter.......	Sacral.............	External rotator of thigh.

MUSCLES, TABLE OF PRINCIPAL.

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Gemellus superior....	Ischial spine and lesser sacro-sciatic notch.	Great trochanter.......	Sacral..............	External rotator of thigh.
Geniohyoglossus.....	Superior genial tubercle of inferior maxillary bone.	Hyoid and inferior surface of tongue.	Hypoglossal.........	Retracts and protrudes tongue.
Geniohyoid	Inferior genial tubercle of inferior maxillary bone.	Body of hyoid.........	Hypoglossal.........	Elevates and advances hyoid.
Gluteus maximus....	Sup. curved iliac line and crest, sacrum, and coccyx.	Fascia and femur below great trochanter.	Inferior gluteal and sacral plexus.	Extends, abducts, and rotates thigh outward.
Gluteus medius......	Ilium between superior and middle curved lines.	Oblique line of great trochanter.	Superior gluteal......	Rotates, abducts, and advances thigh.
Gluteus minimus.....	Ilium between middle and inferior curved lines.	Great trochanter.......	Superior gluteal......	Rotates, abducts, and draws thigh forward.
Gracilis.............	Rami of pubes and ischium.	Tibia, upper and inner part.	Obturator...........	Flexes and abducts leg.
Gubernaculum testis.	See *Cremaster*.			
Hyoglossus..........	Cornua of hyoid..........	Side of tongue	Hypoglossal.........	Depresses side of tongue and retracts tongue.
Iliacus.............	Iliac fossa, crest, base of sacrum.	Lesser trochanter, upper part shaft femur.	Anterior crural.......	Flexes and rotates femur outward.
Iliocostal............	See *Sacrolumbar*.			
Iliopsoas...........	The iliacus and psoas considered as one muscle.			
Infracostals, 10	Inner surface of ribs......	Inner surface of two or three ribs above.	Intercostals.........	Expiration, by depressing ribs.
Infraspinatus........	Infraspinous fossa	Great tuberosity of humerus.	Suprascapular........	Rotates humerus outward.
Intercostals, external, 11.	Outer lip of inferior costal border.	Superior border of ribs above.	Intercostal..........	Raise ribs in inspiration.
Intercostals, internal, 11.	Inner lip of inferior costal border.	Superior border of ribs below.	Intercostal...........	Depress ribs in expiration.
Interossei of foot, dorsal (4).	Adjacent surfaces of metatarsal bones.	Bases of first phalanges.	External plantar.....	Flex first phalanges and extend 2d and 3d, also abduct 2d, 3d, and 4th toes.
Interossei of foot, plantar (3).	Inner lower surface of 3 outer metatarsal bones.	Bases of first phalanges of three outer toes.	External plantar.....	Abduct first phalanges of three outer toes.
Interossei of hand, dorsal (4).	Five metacarpal bones....	Sides of aponeurosis of extensor communis and adjacent parts of first phalanges.	Ulnar...............	Abduct index, middle, and ring fingers, aid in flexing first phalanges and extending second and third.
Interossei of hand, palmar (3).	Sides of metacarpal bones.	Aponeurosis of extensor tendons, adjacent part of first phalanges.	Ulnar...............	Adduct index, ring, and little fingers, aid in flexing first phalanges and in extending second and third.
Interspinales........	Upper surface of spines of vertebræ, near tip.	Posterior part of lower surface of spine above.	Internal divisions of posterior branches of spinal nerves.	Extend the vertebra next above.
Intertransversales...	Between transverse proc. of contiguous vertebræ.	....	Spinal nerves........	Flex laterally the spinal column.
Ischiocavernosus.....	See *Erector penis*.			

MUSCLES, TABLE OF PRINCIPAL.

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Latissimus dorsi.....	Spines of 6 lower dorsal and lumbar and sacral vertebræ, crest of ilium, and 3 or 4 lower ribs.	Bicipital groove of humerus.	Long subscapular....	Draws arm backward and downward and rotates it inward.
Levator anguli oris...	Canine fossa of superior maxillary bone.	Angle of mouth........	Facial, infraorbital branch.	Elevates angle of mouth.
Levator anguli scapulæ	Transverse processes of four upper cervical vertebræ.	Posterior border of scapula.	Fifth cervical and cervical plexus.	Elevates upper angle of scapula.
Levator ani.........	Posterior portion of body and ramus of pubes, pelvic fascia, ischial spine.	Rectum, coccyx, and fibrous raphe.	Sacral and perineal...	Supports rectum and vagina.
Levator labii inferioris.	Incisive fossa of inferior maxillary bone.	Skin of lower lip.......	Facial, supramaxillary branch.	Elevates lower lip.
Levator labii superioris.	Lower margin of orbit....	Upper lip............	Facial, infraorbital branch.	Elevates upper lip.
Levator labii superioris alæque nasi.	Nasal process of superior maxillary bone.	Alar cartilage and upper lip.	Facial, infraorbital branch.	Elevates upper lip, dilates nostril.
Levator menti......	See *Levator labii inferioris.*			
Levator palati.......	Petrous portion of temporal bone.	Soft palate............	Sphenopalatine ganglion (facial).	Elevates soft palate.
Levator palpebræ superioris.	Lesser wing of sphenoid...	Upper tarsal cartilage..	Third...............	Lifts upper lid.
Levatores costarum, 12.	Transverse processes of last cervical and dorsal vertebræ.	Each to the rib below...	Intercostal..........	Raise ribs.
Lingualis...........	Under surface of tongue...	....	Chorda tympani and hypoglossal.........	Elevates middle of tongue.
Longissimus dorsi....	Erector spinæ............	Transverse process of lumbar and dorsal vertebræ and 7th to 11th ribs.	Branches of lumbar and dorsal.	Erects spine and bends trunk backward.
Longus colli—				
1. Superior oblique portion.	Transverse processes 3d to 5th cervical.	Anterior tubercle of atlas.	Lower cervical.......	Flexes cervical vertebræ.
2. Inferior oblique portion.	Bodies of 1st to 3d dorsal.	Transverse processes 5th to 6th cervical.		
3. Vertical portion.	Bodies of three dorsal and two cervical.	Bodies of 2d to 4th cervical.		
Lumbricales, 4, of foot.	Tendons of flexor longus digitorum.	First phalanges of the lesser toes.	Internal and external plantar.	Accessory flexors.
Lumbricales, 4, of hand.	Tendons of flexor profundus digitorum.	Tendons of common extensor.	Median and ulnar....	Flex first phalanges.
Masseter............	Zygomatic arch..........	Angle and ramus of jaw.	Inferior maxillary....	Muscle of mastication.
Multifidus spinæ.....	Sacrum, iliac spine, articular processes lumbar and cervical vertebræ, and transverse proc. of dorsal and 7th cervical.	Laminæ and spines from last lumbar to second cervical vertebræ.	Posterior spinal branches.	Erects and rotates spinal column.
Mylohyoid	Mylohyoid ridge of inferior maxillary bone.	Body of hyoid and raphe.	Inferior dental.......	Elevates and advances hyoid. Forms the floor of the mouth.
Nasolabialis	Nasal septum............	Upper lip.		
Obliquus capitis inferior.	Spinous process of axis....	Transverse process of atlas.	Suboccipital and great occipital.	Rotates altas and cranium.
Obliquus capitis surior.	Transverse process of atlas.	Occipital bone.........	Suboccipital and great occipital.	Draws head backward.

MUSCLES, TABLE OF PRINCIPAL.

Name.	Origin.	Insertion.	Innervation.	Function.
Obliquus externus...	Eight lower ribs..........	Middle line, iliac crest, Poupart's ligament.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera and flexes thorax.
Obliquus inferior....	Orbital plate of superior maxillary bone.	Sclerotic..............	Third cranial........	Rotates eyeball upward and outward.
Obliquus internus....	Lumbar fascia, iliac crest, Poupart's ligament.	Three lower ribs, linea alba, pubic crest, pectineal line.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera, flexes thorax, and assists in expiration.
Obliquus superior....	Above optic foramen, through pulley.	Sclerotic..............	Fourth cranial.......	Rotates eyeball downward and inward.
Obturator externus..	Obturator foramen and membrane.	Digital fossa, base of great trochanter.	Obturator...........	External rotator of thigh.
Obturator internus...	Obturator foramen and membrane.	Great trochanter.......	Sacral..............	External rotator of thigh.
Occipitofrontalis.....	Superior curved line of occiput and angular process of frontal.	Aponeurosis...........	Posterior auricular, small occipital, facial.	Moves scalp. Facial expression.
Omohyoid...........	Upper border of scapula...	Body of hyoid.........	Descendens and communicans noni (hypoglossi).	Depresses and retracts hyoid.
Opponens minimi digiti.	Unciform bone...........	Fifth metacarpal.......	Ulnar................	Flexes little finger.
Opponens pollicis....	Trapezium, anterior annular ligament.	Metacarpal bone of thumb.	Median, palmar division.	Flexes thumb.
Orbicularis oris......	Nasal septum and canine fossa of inferior maxilla, by accessory fibers.	Forms lips and sphincter of mouth.	Facial, buccal and supramaxillary branches.	Closes mouth.
Orbicularis palpebrarum.	Mesal margin of orbit.....	Lateral margin of orbit.	Facial...............	Closes eyelids.
Palatoglossus	Soft palate.............	Side and dorsum of tongue.	Sphenopalatine ganglion.	Constricts the fauces.
Palatopharyngeus ...	Soft palate..............	Thyroid cartilage and pharynx.	Sphenopalatine ganglion.	Closes posterior nares.
Palmaris brevis......	Annular ligament and palmar fascia.	Skin of palm of hand...	Ulnar................	Corrugates skin of palm.
Palmaris interossei ..	Palmar surfaces second, fourth. and fifth metacarpals.	Bases of first phalanges of corresponding fingers.	Ulnar................	Adductors of fingers.
Palmaris longus.....	Internal condyle of humerus.	Annular ligament and palmar fascia.	Median..............	Makes tense the palmar fascia.
Pectineus...........	Iliopectineal line and pubes.	Femur below lesser trochanter.	Anterior crural, obturator.	Flexes and rotates outward the thigh.
Pectoralis major.....	Clavicle, sternum, and costal cartilages.	External bicipital ridge of humerus.	Anterior thoracic, external and internal.	Draws arm downward and forward.
Pectoralis minor.....	Third, fourth, and fifth ribs.	Coracoid process.......	Anterior thoracic	Depresses point of shoulder.
Peroneus brevis......	Middle third of shaft of fibula, externally.	Base of fifth metatarsal.	Musculocutaneous ...	Extends foot.
Peroneus longus.....	Head and shaft of fibula..	First metatarsal of great toe.	Musculocutaneous ...	Extends and everts foot.
Peroneus tertius.....	Lower fourth of fibula....	Fifth metatarsal bone...	Anterior tibial.......	Flexes tarsus.
Plantaris...........	Outer bifurcation of linea aspera and posterior ligament of knee-joint.	Os calcis by means of the tendo Achillis.	Internal popliteal....	Extends foot.
Plantaris interossei..	Shafts of 3d, 4th, and 5th metatarsal bones.	Bases of first phalanges of corresponding toes.	External plantar.....	Adducts toes.

MUSCLES, TABLE OF PRINCIPAL.

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Platysma myoides...	Clavicle, acromion, and fascia.	Inferior maxillary bone, angle of mouth.	Facial and superficial cervical.	Wrinkles skin and depresses mouth.
Popliteus...........	External condyle of femur.	Shaft of tibia above oblique line.	Internal popliteal....	Flexes leg.
Pronator quadratus .	Lower fourth of ulna.....	Lower ¼ shaft of radius.	Anterior interosseous	Pronates hand.
Pronator radii teres .	Internal condyle and coronoid process.	Outer side of shaft of radius.	Median.............	Pronates hand.
Psoas magnus.......	Bodies and transverse processes of last dorsal and all lumbar vertebræ.	Lesser trochanter	Lumbar.............	Flexes and rotates thigh outward, and flexes trunk on pelvis.
Psoas parvus........	Bodies of last dorsal and first lumbar vertebræ.	Iliopectineal eminence and iliac fascia.	Lumbar..	Flexes pelvis upon abdomen.
Pterygoid (external).	Two heads: 1. external pterygoid plate of sphenoid bone; 2. great wing.	Neck of condyle........	Inferior maxillary....	Draws inferior maxillary bone forward.
Pterygoid (internal).	Pterygoid fossa of sphenoid bone.	Inner surface of angle of jaw.	Inferior maxillary....	Raises and draws inferior maxilla forward.
Pyramidalis.........	Pubes..................	Linea alba............	Iliohypogastric......	Tenses linea alba.
Pyramidalis nasi....	Occipitofrontalis	Compressor naris.......	Facial nerve, infraorbital branch.	Depresses eyebrow.
Pyriformis..........	Front of sacrum, through great sciatic foramen.	Great trochanter.......	Sacral branch........	External rotator of thigh.
Quadratus femoris...	Tuberosity of the ischium	Quadrate line of femur.	First sacral and fifth lumbar.	External rotator of thigh.
Quadratus lumborum	Crest of ilium, transverse processes of lower three lumbar vertebræ.	Last rib, transverse processes of upper three lumbar vertebræ.	Upper lumbar and twelfth thoracic.	Flexes thorax laterally.
Quadriceps extensor femoris.	Includes the rectus, vastus internus and externus, and crureus muscles. Their common tendon contains the patella.			
Rectus abdominis....	Pubic crest and fibrous tissues in front of symphysis.	Cartilages of the fifth to seventh ribs.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera and flexes thorax.
Rectus capitis anticus major.	Transverse processes 3d to 6th cervical vertebræ.	Basilar process.........	First and second cervical.	Flexes head and slightly rotates it.
Rectus capitus anticus minor.	Transverse process and lateral mass of atlas.	Basilar process of occipital bone.	First cervical........	Flexes head.
Rectus capitis lateralis.	Ventral cephalic surface of lateral mass of atlas.	Jugular process of occipital bone.	First cervical........	Flexes head laterally.
Rectus capitis posticus major.	Spine of axis............	Inferior curved line of occipital bone.	Suboccipital and great occipital.	Rotates head.
Rectus capitis posticus minor.	Dorsal arch of atlas.....	Below inferior curved line of occipital bone.	Suboccipital and great occipital.	Draws head backward.
Rectus externus.....	Two heads, outer margin of optic foramen.	Sclera................	Sixth cranial........	Rotates eyeball outward.
Rectus femoris......	Anterior inferior iliac spine, brim acetabulum.	Proximal border of patella.	Anterior crural.......	Extends leg.
Rectus inferior......	Lower margin of optic foramen.	Sclera................	Third cranial........	Rotates eyeball downward.
Rectus internus.....	Inner margin of optic foramen.	Sclera................	Third cranial........	Rotates eyeball inward.
Rectus superior......	Upper margin of optic foramen.	Sclera................	Third cranial........	Rotates eyeball upward.
Retrahens aurem....	Mastoid process..........	Concha...............	Posterior auricular. ..	Retracts pinna.

MUSCLES, TABLE OF PRINCIPAL.

Name.	Origin.	Insertion.	Innervation.	Function.
Rhomboideus major.	Spines of first five thoracic vertebræ.	Root of spine of scapula.	Fifth cervical	Elevates and retracts scapula.
Rhomboideus minor.	Spines of seventh cervical and first dorsal vertebræ.	Root of spine of scapula.	Fifth cervical	Retracts and elevates scapula.
Risorius	Fascia over masseter	Angle of mouth	Facial, buccal branch.	Draws angle laterally.
Rotatores spinæ	Transverse processes of from second to twelfth thoracic vertebræ.	Lamina of next vertebra above.	Dorsal branches	Rotate spinal column.
Sacrolumbalis	Erector spinæ	Angle of six lower ribs.	Branches of dorsal	Erects spine and bends trunk backward.
Sartorius	Anterior superior spine of ilium.	Upper internal portion of shaft of tibia.	Anterior crural	Flexes and crosses legs.
Scalenus anticus	Scalene tubercle on first rib.	Transverse processes 3d to 6th cervical vertebræ.	Lower cervical	Flexes neck laterally.
Scalenus medius	First rib	Transverse processes of six lower cervical vertebræ.	Lower cervical	Flexes neck laterally.
Scalenus posticus	Second rib	Transverse processes of three lower cervical vertebræ.	Lower cervical	Bends neck laterally.
Semimembranosus	Tuberosity of ischium	Inner tuberosity of tibia	Great sciatic	Flexes leg and rotates it inward.
Semispinalis coli	Transverse processes four upper dorsal and articular processes four lower cervical vertebræ.	Spines of second to fifth cervical vertebræ.	Cervical branches	Erects spinal column.
Semispinalis dorsi	Transverse processes 6th to 10th dorsal vertebræ.	Spines last two cervical and first four thoracic.	Branches of dorsal	Erects spinal column.
Semitendinosus	Tuberosity of ischium	Upper and inner surface of tibia.	Great sciatic	Flexes leg on thigh.
Serratus magnus	Eight upper ribs	Inner margin of dorsal border of scapula.	Posterior thoracic	Elevates ribs in inspiration.
Serratus posticus inferior.	Spines of last two thoracic and first three lumbar.	Four lower ribs	Tenth and eleventh intercostal.	Depresses ribs in expiration.
Serratus posticus superior.	Spines of seventh cervical and first two thoracic vertebræ.	Second, third, fourth, and fifth ribs.	Second and third intercostal.	Raises ribs in inspiration.
Soleus	Shaft of fibula, oblique line of tibia.	Os calcis by tendo Achillis.	Internal popliteal and posterior tibial.	Extends foot.
Sphincter ani, external.	Tip of coccyx	Tendinous center of perineum.	Perineal, pudic, and fourth sacral.	Closes anus.
Sphincter ani, internal.	A thickening of the circular fibers of the intestine one inch above the anus.		Hemorrhoidal nerves.	Constricts rectum.
Sphincter vaginæ	Central tendon of perineum.	Corpora cavernosa of clitoris.	Homologue of accelerator urinæ in male.	
Sphincter vesicæ internus.	Near the urethral orifice of the bladder.		Vesical nerves	Constricts internal orifice of urethra.
Spinalis cervicis (*normal, but inconstant*).	Spines 5th, 6th, and 7th cervical and first two thoracic vertebræ.	Spine of axis, sometimes spines of 3d and 4th cervical vertebræ.		
Spinlis colli	Spines of fifth and sixth cervical vertebræ.	Spine of axis, or third and fourth cervical spines.	Cervical branches	Steadies neck.
Spinalis dorsi	Last two thoracic and first two lumbar spines.	Remaining thoracic spines.	Dorsal branches	Erects spinal column.

MUSCLES, TABLE OF PRINCIPAL.

Name.	Origin.	Insertion.	Innervation.	Function.
Splenius capitis	Lower two-thirds ligamentum nuchæ, spines of seventh cervical and first two thoracic vertebræ.	Outer third of middle oblique line of occiput and outer surface of mastoid process.	Middle cervical, posterior branches.	Extends head and neck and rotates and flexes laterally.
Splenius colli.	Spines of third to sixth thoracic vertebræ.	Dorsal tubercles of transverse processes of upper three or four cervical vertebræ.	Posterior divisions of lower cervical.	Extends, flexes laterally, and rotates neck.
Stapedius	Interior of pyramid	Neck of stapes	Facial	Depresses base of stapes.
Sternocleidomastoid.	Two heads, sternum and clavicle.	Mastoid process and outer half of superior oblique line of occiput.	Spinal accessory and cervical plexus.	Depresses and rotates head.
Sternohyoid	Sternum and clavicle	Hyoid bone	Descending and communicating branches of the hypoglossal.	Depresses hyoid.
Sternothyroid	Sternum and cartilage of first rib.	Side of thyroid cartilage.	Descendens and communicans hypoglossi.	Depresses larynx.
Styloglossus	Styloid process	Side of tongue	Hypoglossal	Elevates and retracts tongue.
Stylohyoid	Styloid process	Body of hyoid	Facial	Draws hyoid upward and backward.
Stylopharyngeus	Styloid process	Thyroid cartilage	Glossopharyngeal, and pharyngeal plexus	Elevates pharynx.
Subanconeus	Humerus above olecranon fossa.	Posterior ligament of elbow.	Musculospiral.	Tensor of ligament.
Subclavius	Cartilage of first rib	Inferior surface of clavicle.	Fifth and sixth cervical.	Draws clavicle downward.
Subcrureus.	Anterior distal part of femur.	Synovial sac behind patella.	Anterior crural	Draws sac up.
Subscapularis	Subscapular fossa	Humerus, lesser tuberosity, and shaft.	Subscapular	Chief internal rotator of humerus.
Supinator longus	External condyloid ridge of humerus.	Styloid process of radius.	Musculospiral	Flexes forearm.
Supinator radii brevis.	External condyle of humerus, oblique line of ulna.	Neck of radius and its bicipital tuberosity.	Posterior interosseous.	Supinates hand.
Supraspinales	Lie on spinous processes in cervical region.			
Supraspinatus	Supraspinous fossa	Great tuberosity of humerus.	Suprascapular	Supports shoulder-joint, raises arm.
Temporal	Temporal fossa and fascia.	Coronoid process of mandible.	Inferior maxillary	Closes mandible.
Tensor palati	Scaphoid fossa and alar spine of sphenoid.	About hamular process into soft palate.	Otic ganglion	Renders palate tense.
Tensor tarsi	Crest of lacrimal bone	Tarsal cartilages	Facial, infraorbital branch.	Compresses puncta and lacrimal sac.
Tensor tympani	Temporal bone, Eustachian tube and canal, sphenoid bone.	Handle of malleus	Otic ganglion	Renders tense the membrana tympani.
Tensor vaginæ femoris.	Iliac crest and anterior superior spinous process.	Fascia lata	Superior gluteal	Tensor of fascia.
Teres major	Inferior angle of scapula	Internal bicipital ridge of humerus.	Subscapular	Draws arm downward and backward.

MUSCLES, TABLE OF PRINCIPAL.

NAME.	ORIGIN.	INSERTION.	INNERVATION.	FUNCTION.
Teres minor	Axillary border of scapula	Great tuberosity of humerus.	Circumflex	Rotates humerus outward and adducts it.
Thyrohyoid	Side of thyroid cartilage	Body and greater cornu of hyoid bone.	Hypoglossal	Elevates larynx.
Tibialis anticus	Outer tuberosity and upper part of shaft of tibia.	Internal cuneiform and first metatarsal bone.	Anterior tibial	Flexes tarsus and elevates inner border of foot.
Tibialis posticus	Shaft of fibula and tibia, interosseous membrane.	Tuberosity of scaphoid, internal cuneiform, and bases of second to fourth metatarsal.	Posterior tibial	Extends tarsus and inverts foot.
Trachelomastoid	Transverse processes of 3d to 6th thoracic, and articular processes of last 3 or 4 cervical vertebræ.	Mastoid process	Branches of cervical	Steadies head.
Transversalis abdominis.	Poupart's ligament, iliac crest, lower six ribs, lumbar vertebræ.	Linea alba, pubic crest, pectineal line.	Intercostal, iliohypogastric, ilioinguinal.	Compresses viscera and flexes thorax.
Transversalis colli	Transverse processes of third to sixth thoracic vertebræ.	Transverse processes of five lower cervical vertebræ.	Cervical branches	Keeps neck erect.
Transversus pedis	Head 5th metatarsal and plantar ligaments of metatarsophalangeal joints.	First phalanx of great toe.	External plantar	Adducts great toe.
Transversus perinei	Ramus of ischium	Central tendon	Perineal	Tensor of central tendon.
Transversus perinei, deep.	See *Compressor urethræ.*			
Trapezius	Superior curved line of occipital bone, spinous processes of last cervical and all the dorsal vertebræ.	Clavicle and spine of scapula, and acromion.	Spinal accessory and cervical plexus.	Draws head backward.
Triangularis sterni	Ensiform cartilage, costal cartilages of 3 or 4 lower true ribs, and sternum.	Border of inner surfaces 2d, 3d, 4th, and 5th costal cartilages.	Intercostal	Expiration.
Triceps (3 *heads*) extensor cubiti	*External* and *internal* near musculospiral groove, shaft of humerus; *middle* or *long*, lower margin of glenoid cavity.	Olecranon process of ulna.	Musculospiral	Extends forearm.
Vastus externus	Anterior border great trochanter and linea aspera.	Tuberosity of tibia	Anterior crural	Extends leg
Vastus internus and crureus.	Inner lip of linea aspera of femur.	Tuberosity of tibia	Anterior crural	Extends leg.
Zygomaticus major et minor.	Malar bone	Angle of mouth	Facial, infraorbital branch.	Elevates lip outward.

MUSCLES GROUPED ACCORDING TO FUNCTIONS.*

[The exact functions of many of the muscles have not yet been decisively determined. Anatomical studies, the construction of mechanical models, the electrical stimulation of the musculature, and observation of the muscular activities of normal individuals and of individuals in whom given muscles or sets of muscles are absent or paralyzed, have all proved valuable methods of investigation, but each method has its drawbacks, and knowledge of the part actually played by individual muscles in the normal activities of the body is as yet merely approximate. Owing to the influence of gravity, the relations of other muscles to the skeleton, and similar factors, a given muscle may perform functions which would not be deduced from a simple study of the relations of the muscle to the skeleton. Thus the iliacus serves to flex not only the hip, but also the knee, and the hamstring muscles may flex the hip while flexing the knee. The functions ascribed to various muscles in the following tables, although an attempt has been made to base them upon the more recent work on the action of the muscles, must be taken to be merely approximately correct.]

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*From Dr. Charles R. Bardeen's article in Morris' Anatomy.

1. **Facial muscles.**

These serve essentially to contract the various visceral orifices of the head or to retract the tissue surrounding them.

Ear.

Retractors: Attrahens aurem, attollens aurem, and retrahens aurem.

Orbit.

(a) *Retractor:* Occipitofrontalis. The levator palpebræ superioris, innervated by the third cranial nerve, serves to raise the upper lid of the eye.

(b) *Contractors:* Orbicularis palpebrarum, corrugator supercilii and pyramidalis nasi.

Nasal orifice.

(a) *Dilators:* Levator labii superioris alæque nasi, transverse portion of the compressor naris, and the dilatores naris.

(b) *Contractors:* Compressor naris and the depressor alæ nasi.

Oral orifice.

(a) *Retractors:*

Upward: Zygomaticus major and minor, levator labii superioris, levator labii superioris alæque nasi.

Lateralward: Zygomaticus major, levator anguli oris, risorius, platysma myoides, depressor anguli oris, buccinator.

Downward: Depressor anguli oris, depressor labii inferioris, platysma myoides.

(b) *Contractors:* Orbicularis oris.

(c) *Protractors of the lips:* Part of the orbicularis oris, levator menti.

2. **Muscles acting on the eyeball.**

To adduct the pupil: Internal rectus.

To abduct the pupil: External rectus

To rotate the pupil upward: Superior rectus, in association with the inferior oblique.

To rotate the pupil downward: Inferior rectus, in association with the superior oblique.

3. **Muscles acting on the lower jaw.**

(a) *To raise it:* Masseter, temporal, internal pterygoid.

(b) *To lower it:* External pterygoid, digastric, mylohyoid, geniohyoid, and the infrahyoid muscles. The weight of the jaw also plays a part in this movement.

(c) *To protract it:* External pterygoid and internal pterygoid.

(d) *To retract it:* The inferior dorsal portion of the temporal, the digastric, mylohyoid, and geniohyoid.

(e) *To produce lateral movements:* The external pterygoid acting on one side carries the jaw toward the opposite side. The masseter draws it slightly toward the side on which the muscle lies. This action of the masseter is overcome by the internal pterygoid (Riegner).

4. **Muscles acting on the hyoid bone.**

(a) To *elevate it:* Digastric, stylohyoid, styloglossus, mylohyoid, geniohyoid, genioglossus, hyoglossus, and the middle constrictor of the pharynx.

(b) *To depress it:* Thyrohyoid, sternohyoid, omohyoid, sternothyroid.

(c) *To protract it:* Genioglossus (inferior portion), geniohyoid, anterior belly of digastric, and the mylohyoid.

(d) *To retract it:* Posterior belly of digastric, stylohyoid, and the middle constrictor of the pharynx.

5. **Muscles acting on the larynx.**

(a) *To elevate it:* Thyrohyoid, stylopharyngeus, palatopharyngeus, the inferior constrictor of the pharynx, and the elevators of the hyoid bone.

(b) *To depress it:* Sternothyroid, sternohyoid, and omohyoid.

(c) *To approximate the vocal cords:* Lateral cricoarytenoid, posterior cricoarytenoid (in conjunction with the preceding muscle); internal thyroarytenoid, external thyroarytenoid; transverse arytenoid.

(d) *To make the vocal cord tense:* Cricothyroid, lateral cricoarytenoid, posterior cricoarytenoid, transverse arytenoid.

(e) *To widen the rima glottidis:* Posterior cricoarytenoid.

(f) *To relax the vocal cord:* External thyroarytenoid, internal thyroarytenoid.

6. **Muscles acting on the tongue.**

(a) *To elevate it:* Styloglossus (especially along the sides), palatoglossus, glossopharyngeus, and the elevators of the hyoid bone.

(b) *To depress it:* Genioglossus (in the center), hyoglossus (at the sides), chondroglossus, and the depressors of the hyoid bone.

(c) *To protrude it:* Genioglossus (middle and inferior portions).

(d) *To retract it:* Genioglossus (anterior portion), styloglossus, chondroglossus.

(e) *To shorten it and make it bulge upward:* Superior and inferior lingual.

(f) *To narrow it and make it bulge upward:* Transverse lingual.

(g) *To flatten it:* Vertical lingual.

When the muscles work symmetrically, these movements are symmetrical; when they do not work symmetrically, the tongue is moved from side to side, rotated, etc.

7. **Muscles acting on the palate and pharynx.**

(a) *To narrow the pharyngeal opening of the Eustachian tube:* Levator palati.

(b) *To widen the isthmus of the Eustachian tube:* Levator palati.

(c) *To open the tube:* Tensor palati.

(d) *To raise and shorten the uvula:* Azygos uvulæ.

(e) *To depress the soft palate:* Palatoglossus, palatopharyngeus.

(f) *To make tense the soft palate:* Tensor palati.

(g) *To lift the soft palate:* Levator palati.

(h) *To approximate the anterior pillars of the fauces:* Palatoglossus.

(i) *To approximate the posterior pillars of the fauces:* Palatopharyngeus, superior constrictor of the pharynx.

(j) *To constrict the pharynx:* Superior, middle, and inferior constrictors.

(k) *To widen the pharynx:* Stylopharyngeus and the muscles which protract the hyoid bone.

(l) *To elevate the pharynx:* Stylopharyngeus, palatopharyngeus.

8. **Muscles acting on the head.**

(a) *To flex it:* The supra- and infrahyoid muscles (except the posterior belly of the digastric), rectus capitis anticus major and minor.

(b) *To extend it:* Sternocleidomastoid, trapezius, splenius capitis, trachelomastoid, complexus, obliquus capitis superior, rectus capitis posticus major and minor, and the posterior belly of the digastric.

(c) *To bend it laterally:* Sternocleidomastoid, rectus capitis lateralis, splenius capitis, trachelomastoid, complexus, obliquus capitis superior.

(d) *To rotate it:* Sternocleidomastoid, trapezius, splenius capitis, trachelomastoid, complexus, obliquus capitis superior and inferior, rectus capitis posticus major and minor.

9. **Muscles acting on the spinal column.**

(a) *To flex it:* Sternocleidomastoid, longus colli, rectus capitis anticus major, psoas major and minor, scaleni, rectus abdominis, obliquus abdominis externus and internus, levator ani, coccygeus and sphincter ani.

(b) *To extend it:* Splenius capitis, splenius colli, erector spinæ, semispinalis dorsi, semispinalis colli, complexus, multifidus spinæ, rotatores, interspinales, levatores costarum, quadratus lumborum.

(c) *To bend it laterally and rotate it:* Sternocleidomastoid, scaleni, longus colli, trapezius, levator anguli scapulæ, splenius capitis and colli, semispinalis dorsi, semispinalis colli, complexus, multifidus spinæ, rotatores, intertransversales, levatores costarum, psoas major and minor, quadratus lumborum, obliquus abdominis externus and internus, and rectus abdominis.

10. **Muscles of respiration.**

Quiet inspiration: The external intercostals, anterior portion of internal intercostals, diaphragm.

Enforced inspiration: In addition to the muscles mentioned above, the scaleni, sternocleidomastoid, serratus posticus superior and inferior, rhomboids, serratus anticus, latissimus dorsi, pectoralis major and minor, and the extensors of the spinal column

Quiet expiration: Posterior part of internal intercostals, subcostals, and triangularis sterni.

Enforced expiration: In addition to the muscles mentioned above, the abdominal muscles, sacrolumbalis, and the quadratus lumborum.

The chief muscles of respiration are the intercostals; the diaphragm plays a minor part (Fick).

11. Muscles acting on the abdomen.

(a) *Constriction of the abdominal cavity:* Obliquus abdominis externus and internus, the transversalis and rectus abdominis, and the diaphragm, levator ani, and coccygeus.

(b) *Reduction of pressure in the abdominal cavity:* The muscles of inspiration, with the exception of the diaphragm, serve to lessen the compression of the abdominal viscera.

12. Action of the muscles of the perineal region.

(a) *To close anal canal:* Sphincter ani externus.

(b) *To constrict the anal portion of the rectum:* Levator ani (pubococcygeal portion).

(c) *To constrict the bulbus urethræ and the corpus cavernosum urethræ* (corpus spongiosum): Bulbocavernosus.

(d) *To elevate the prostate gland:* Levator ani.

(e) *To constrict the vagina:* Bulbocavernosus, levator ani (pubococcygeal portion).

(f) *To cause erection of penis and clitoris:* Ischiocavernosus, bulbocavernosus, and compressor urethræ.

(g) *To compress the urethra and Cowper's gland:* compressor urethræ and the transversus perinei.

(h) *To support and lift the pelvic floor:* Levator ani, coccygeus, transversus perinei.

13. Muscles acting on the shoulder-girdle.

The two joints acted upon are the sternoclavicular and the acromioclavicular. The movements produced consist in lifting and lowering the shoulder, carrying it forward and backward, and rotating it.

(a) *Elevation:* Levator anguli scapulæ, trapezius (upper portion), sternocleidomastoid, rhomboidei, serratus magnus (middle portion), omohyoid.

(b) *Depression:* Trapezius (lower portion), pectoralis major (lower portion), pectoralis minor, subclavius, latissimus dorsi. The weight of the limb is likewise a factor.

(c) *Forward movement:* Serratus magnus, pectorales major and minor.

(d) *Backward movement:* Trapezius, rhomboidei, latissimus dorsi.

(e) *Rotation:*

Associated with abduction of the arm: Serratus magnus (inferior portion), trapezius (superior part), levator anguli scapulæ.

Associated with adduction of the arm: Rhomboidei, trapezius (inferior part), serratus magnus (upper part), pectoralis major (pectoral portion), latissimus dorsi.

14. Muscles acting on the arm at the shoulder-joint.

(a) *To abduct it:* Deltoid, supraspinatus, biceps (long head). The inferior part of the serratus magnus and the superior part of the trapezius are important in the early stages of abduction of the arm; the clavicular portion of the pectoralis major in supraabduction.

(b) *To adduct it:* Pectoralis major, latissimus dorsi, teres major, coracobrachialis, triceps (long head). To these should be added the weight of the limb.

(c) *To flex it:* Pectoralis major, deltoid (anterior portion), subscapularis, coracobrachialis, biceps (short head), and the serratus magnus.

(d) *To extend it:* Deltoid (posterior portion), teres major, latissimus dorsi. The upper and middle portions of trapezius, and the levator anguli scapulæ play an important part in extension of the arm.

(e) *To rotate it outward:* Infraspinatus, teres minor, and possibly the posterior portion of the deltoid.

(f) *To rotate it inward:* Subscapularis, deltoid (anterior fibers), teres major, latissimus dorsi, and pectoralis major.

15. Muscles acting on the forearm at the elbow-joint (arranged in order of force exerted according to W. Grohmann).

(a) *Flexion at elbow:*

Forearm supinated: Brachialis, long head of biceps, supinator longus, short head of biceps, extensor carpi radialis longus, pronator radii teres, flexor carpi radialis, extensor carpi radialis brevis, palmaris longus.

Forearm in mid-position or pronated: Brachialis anticus, supinator longus, long head of biceps, short head of biceps, extensor carpi radialis longus, pronator radii teres, flexor carpi radialis, extensor carpi radialis brevis, palmaris longus.

(b) *Extension at elbow:* Triceps, anconeus.

(c) *Pronation of forearm:*

Forearm extended: Pronator radii teres, flexor carpi radialis, pronator quadratus, palmaris longus.

Forearm at right angles: Pronator radii teres, supinator longus, flexor carpi radialis, pronator quadratus, extensor carpi radialis longus, palmaris longus.

Forearm flexed: Pronator radii teres, supinator longus, flexor carpi radialis, pronator quadratus, extensor carpi radialis longus, palmaris longus.

(d) *Supination:*

Forearm extended: Supinator longus, short head of biceps, long head of biceps, supinator brevis extensor carpi radialis longus, extensor ossis metacarpi pollicis, extensor primi internodii, extensor secundi internodii pollicis, extensor indicis.

Forearm at right angles: Short head of biceps, long head of biceps, supinator brevis, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, supinator longus (in pronation), extensor secundi internodii pollicis, extensor indicis.

Forearm flexed: Short head of biceps, long head of biceps, supinator brevis, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, extensor secundi internodii pollicis, extensor indicis.

16. Muscles acting on the hand at the wrist.

(a) *To flex it:* Flexor carpi radialis, palmaris longus, flexor carpi ulnaris, long flexors of the thumb and fingers, extensor ossis metacarpi pollicis.

(b) *To extend it:* Extensor carpi radialis longus and brevis, extensor carpi ulnaris, and the extensors of the thumb and fingers.

(c) *To abduct it:* Extensor carpi radialis brevis and longus, extensor ossis metacarpis pollicis, extensor primi internodii pollicis, flexor carpi radialis.

(d) *To adduct it:* Flexor carpi ulnaris, extensor carpi ulnaris.

17. Muscles acting on the fingers.

(a) *To flex all the joints:* Flexor profundus digitorum; all but the last: flexor sublimis digitorum; the metacarpophalangeal joint only: flexor brevis minimi digiti, the lumbricales, and interossei.

(b) *To extend the fingers:* Extensor communis digitorum, extensor indicis, extensor minimi digiti; to extend the two interphalangeal joints: the lumbricales, interossei, and frequently the flexor brevis minimi digiti.

(c) *To abduct from the axis passing through the center of the middle finger:* Dorsal interossei, first two lumbricals, abductor minimi digiti.

(d) *To adduct toward this axis:* Palmar interossei, last two lumbricals, opponens and flexor minimi digiti.

18. Muscles acting on the thumb.

(a) *To flex all joints:* Flexor longus pollicis; the carpometacarpal and metacarpophalangeal joints: flexor brevis, the adductors, abductor brevis; the carpometacarpal joints: opponens pollicis, extensor ossis metacarpi pollicis.

(b) *To extend all joints:* Extensor longus pollicis; the carpometacarpal and metacarpophalangeal joints: extensor brevis pollicis.

(c) *To adduct:* The adductor, flexor brevis, opponens, first dorsal interosseous, extensor longus.

(d) *To abduct:* The long and short abductors, the extensor brevis.

19. Muscles acting on the pelvis.

(a) *To flex it:* Rectus abdominis, obliquus abdominis externus and internus, psoas major and minor.

(b) *To extend it:* Erector spinæ and multifidus spinæ.

(c) *To bend it laterally and rotate it:* Abdominal muscles, quadratus lumborum, and psoas muscles acting on one side.

20. **Muscles acting on the thigh at the hip-joint.**
    - (*a*) *To flex it:* Iliopsoas, sartorius, rectus femoris, pectineus, gracilis, adductor longus and brevis, tensor vaginæ femoris.
    - (*b*) *To extend it:* Gluteus maximus, biceps, semitendinosus, semimembranosus, adductor magnus.
    - (*c*) *To adduct it:* Gracilis, pectineus, adductor longus, brevis, and magnus, gluteus maximus (lower portion), quadratus femoris, obturator externus.
    - (*d*) *To abduct it:* Gluteus medius and minimus, tensor vaginæ femoris, gluteus maximus; and when the hip is flexed, the pyriformis, obturator internus, and gemelli.
    - (*e*) *To rotate it inward:* Tensor vaginæ femoris, gluteus medius (anterior portion), gluteus minimus, iliopsoas.
    - (*f*) *To rotate it outward:* Pyriformis, obturator internus and gemelli, obturator externus, quadratus femoris, gluteus maximus, gluteus medius (posterior portion), sartorius, pectineus, adductor longus, brevis, and magnus (superior and middle fasciculi), biceps.
21. **Muscles acting on the leg at the knee-joint.**
    - (*a*) *To flex it:* Sartorius, gracilis, semitendinosus, semimembranosus, biceps, gastrocnemius, popliteus.
    - (*b*) *To extend it:* Quadriceps femoris (the tensor vaginæ femoris and gluteus maximus through the iliotibial band serve to keep the extended leg fixed).
    - (*c*) *To rotate it inward* (when flexed): Sartorius, gracilis, semitendinosus, semimembranosus, popliteus.
    - (*d*) *To rotate it outward* (when flexed): Biceps.
22. **Muscles acting on the foot at the ankle-joint** (arranged in order of force exerted, according to R. Fick).
    - (*a*) *To flex it:* Tibialis anticus, extensor longus digitorum, extensor longus hallucis, peroneus tertius.
    - (*b*) *To extend it:* Soleus, gastrocnemius, flexor longus hallucis, peroneus longus, tibialis posticus, flexor longus digitorum, peroneus brevis.
    - (*c*) *To invert the foot at the inferior articulation of the talus* (art. talocalcanea and talocalcaneonavicularis): soleus, gastrocnemius, tibialis posticus, flexor longus hallucis, flexor longus digitorum.
    - (*d*) *To evert the foot at the inferior articulation of the talus:* Peroneus longus, peroneus brevis, extensor longus digitorum, peroneus tertius, extensor longus hallucis, tibialis anticus.
    - (*e*) *To invert the foot at Chopart's* (talonavicularcalcaneocuboid) *joint:* Tibialis anticus, tibialis posticus, flexor longus hallucis, flexor longus digitorum, extensor longus hallucis.
    - (*f*) *To evert the foot at Chopart's joint:* Peroneus longus, peroneus brevis, extensor longus digitorum, peroneus tertius.
23. **Muscles acting on the toes** (arranged in order of force exerted, according to R. Fick).
    - (*a*) *To flex all the joints:* Flexor longus digitorum, flexor accessorius digitorum, and flexor longus hallucis; the first interphalangeal and the metacarpophalangeal joints of the four lateral toes: flexor brevis digitorum; the metacarpophalangeal joints: the lumbricals, interossei, abductor hallucis, adductor hallucis (oblique head), flexor brevis hallucis, abductor minimi digiti, flexor minimi digiti.
    - (*b*) *To extend all joints:* Extensor longus digitorum, extensor longus hallucis, extensor brevis digitorum, the interphalangeal joints: the lumbricales, and the adductors and abductors of the big and little toes.
    - (*c*) *To abduct from an axis passing through the second toe:* Abductor hallucis, dorsal interossei, abductor minimi digiti, first lumbrical.
    - (*d*) *To adduct toward this axis:* Adductores hallucis, plantar interossei, three more lateral lumbricals.
    - (*e*) *To draw together the ends of the metatarsals:* The transverse head of the adductor of the big toe.

MUSCLES, INFLAMMATION.—See MYOSITIS.

MUSCLES, INJURIES.—**Atrophy** of muscles arises from want of use, from continued pressure, from injury, from interference with the blood supply, from disease of the nerves or their centers, or from lead-poisoning. Treatment must be according to the cause, with the use of galvanism, passive motion, friction, massage, etc.

Contractions of muscles result from injury, from joint-disease, from disease of the nervous system, and from malposition of parts. Sudden or gradual extension, tenotomy, and myotomy, are the means of treatment. Nerve stretching is of value when the contraction is spasmodic.

Dislocation of muscles and tendons is more usually the result of accident, associated with chronic joint-disease, or of fracture than of solitary injury. The long head of the biceps is most often displaced. Early in rheumatoid arthritis of the shoulder-joint the long head of this muscle is displaced, and the tendon absorbed. The muscles of the forearm may be dislocated. In treating a dislocated muscle or tendon reduction is generally easy, but the displacement is likely to recur, since the sheath of the muscle or tendon has been lacerated. The limb should be relaxed to reduce a dislocation of this nature, and the tendon manipulated. A splint should be applied, so that pressure is made on the point of injury, but the muscle is relaxed. If firm adhesion of the tendon does not occur in 4 weeks, operation should be performed, incision made, and the edges of the torn sheath freshened and sewed with chromic catgut or kangaroo tendon. Passive movements may begin at the end of the first week. Fibrous tissue forms when the ends of divided muscles are widely separated, but when the ends are closely approximated, this fibrous tissue becomes filled with muscle-fibers resembling true muscle.

Hernia of muscles is treated by incision and stitching of the fascia covering the muscle.

Hypertrophy of muscle arises from excessive use, and in pseudohypertrophic paralysis the muscle bulk is greatly augmented, but there is less muscle structure and more fat and connective tissue.

Rupture of a muscle may be followed by atrophy. A limited rupture is to be treated as a strain, but when it is extensive and the ends widely separated, it should be incised and sutured with chromic catgut, the skin being sewed with silkworm-gut. Rest, relaxation, and other means of combating inflammation are to be employed.

A strain is the name given to the condition in which there is a small amount of rupture with stretching of the muscle. The deltoid, the hamstring, the calf, the back, the biceps, and the great pectoral muscles are those mostly strained. Strain of the pronator radii teres muscle gives rise to the "**lawn-tennis arm.**" "**Rider's leg**" is produced by a strain of the adductors of the thigh. Strain of the psoas magnus muscle may suggest appendicitis, but there is no local tenderness, abdominal rigidity, nor constitutional symptoms.

The treatment of strains consists in relaxation by suitable position, rest by the use of splints, and rest in bed, bandages for compression, and the application of hot water, hot lead-water and laudanum, and of ichthyol. Dover's powder or morphin may be used if the pain is excessive.

Wounds and Contusions.—Contusions of muscles vary in severity and in extent, and may be followed by suppuration, inflammation, or atrophy. Wounds of muscles are open or subcutaneous, longitudinal or transverse. When the wound is transverse, it is best to unite the gaping edges of the muscle by catgut stitches. When the wound is longitudinal, drainage should be provided. Rest by means of splints, proper position, and relaxation are to be obtained, and inflammation combated. Bandaging may prevent much swelling, while the early use of cold limits the spread of inflammation. Lead-water and laudanum are useful. Iodin, blue ointment, ichthyol, and intermittent heat are of value when repair is well advanced. As soon as the acute symptoms subside, massage, passive motion, stimulating liniments, and galvanism, if the reaction of degeneration exists, or faradism, if it does not exist, are to be employed.

MUSCLES, PROGRESSIVE ATROPHY.—Synonyms.—Wasting palsy; chronic spinal muscular atrophy; chronic anterior poliomyelitis; Duchenne-Aran's disease.

Definition.—A slowly progressive wasting and atrophy of certain groups of muscles, with symptoms varying in accordance with the variations in the pathologic anatomy.

Etiology.—It is most frequent in males between 25 and 50 years of age, and in many instances is hereditary. A predisposing cause seems to exist in those who habitually use one set of muscles (muscular strain). Exposure to cold and damp, lead-poisoning, syphilis, and injuries to the spinal column are other causes. It follows such acute diseases as diphtheria, measles, acute rheumatism, typhoid and typhus fevers.

Pathologic Anatomy.—The morbid alterations are of two groups—spinal and muscular.

The spinal changes consist in the atrophy and degeneration of the anterior columns, wasting and disappearance of the multipolar ganglion cells of the anterior horns, with hyperplasia of the neuroglia; rarely the hyperplasia extends to the lateral columns (amyotrophic lateral sclerosis); also wasting, atrophy, and degeneration of the anterior nerve-roots.

The muscular changes consist of a progressive wasting of the muscular tissue, with increase of the interstitial connective tissue. The final result is that the muscle is converted into a mere fibrous band with numerous fat-cells, the development of this material taking place outside of the muscular elements and in the newly formed connective tissue.

Symptoms.—The invasion is gradual, the disease having been in progress some weeks or months before the patient is aware of its existence. Wasting usually begins in the hand, the first dorsal interosseous being the first to be attacked, then the muscles of the thenar and hypothenar eminences, then the deltoid, and so on from group to group. Often, however, the extension is very erratic in its course, jumping from one group to another at some distance. In the immense majority of cases the disease is permanently limited to one or a few groups of muscles in the upper, or, more rarely, in the lower, extremities. The only muscles not yet known to be attacked are those of mastication and those that move the eyeball (Roberts).

Fibrillary contraction is an early symptom, continuing more or less marked so long as any muscular fibers remain. It consists of wave-like movements of the muscles, excited automatically by drafts of air or percussion. Coincident with the wasting are loss of power, disorders of sensation, coolness and pallor of the surface. The natural roundness and contour of the body and limbs are changed, the bones standing out in unaccustomed distinctness, giving the individual the appearance of a skeleton clothed in skin. The hand is frequently the seat of a very singular deformity—the "claw-shaped" hand. The electrocontractility is preserved so long as muscular fibers remain.

Diagnosis.—When wasting palsy is fully developed, its diagnosis is a simple matter. In its early stages a doubt may exist, but attention to the history, symptoms, and progress will determine the question.

Syringomyelia often begins with muscular atrophy as a marked symptom, and may be confounded with wasting palsy, the chief points of distinction between which are, the loss of power of perceiving heat, or, often, to distinguish between heat and cold, and the appearance of trophic changes, such as a dusky or purplish hue of the hands, with a uniform thickness resembling myxedema, the development of blebs and ulcers, and changes in the nails. Arthropathies are sometimes met with. See MUSCLES (Progressive Dystrophies).

Prognosis is very unfavorable, although the danger to life is often very remote. The disease may be arrested and remain stationary for years.

Treatment.—Internal medication seems to have no effect on the malady, although if mineral poisoning is suspected, potassium iodid should be used, and if syphilis is suspected, a course of potassium iodid and mercury should be administered. Arsenic, strychnin sulphate, and cod-liver oil, with a generous diet, are among the remedies indicated. If the disease is the result of over-working any set of muscles, these must be allowed a rest. A most effective remedy in wasting palsy is, undoubtedly, galvanism. See MOTOR POINTS.

Massage is a valuable adjuvant to the electric treatment, as are hot sponging and rubbing along the spine.

MUSCLES, PROGRESSIVE DYSTROPHIES.—Progressive muscular dystrophy is a term employed to designate all forms of progressive muscular weakness with atrophy, in which the seat of the lesion is in the muscle itself. The dystrophies are to be distinguished on the one hand from progressive spinal muscular atrophy which is due to a chronic progressive degeneration of the gray matter of the spinal cord, and, on the other hand, from chronic multiple neuritis, in which the lesion is in the nerve-fibers. If the lesion of a disease characterized by progressive muscular weakness and atrophy is located in the gray matter of the spinal cord, it is called *amyotrophy;* if it is located in the nerve, it is called *neural atrophy;* if it is located in the muscle itself, it is called *myopathy*. In any case exhibiting progressive muscular weakness and atrophy it is the physician's first duty to determine whether he has to deal with an amyotrophy, a myopathy, or a neural atrophy. But it is always well to bear in mind that the large multipolar cell in the anterior horn of the cord, with its axis-cylinder process (neuraxon) and the muscle-fibers to which it is distributed, constitutes a trophic unit, and that a disease process may involve more than one portion of this trophic unit. It may begin in one, and spread to an adjoining portion. Indeed, it is questionable whether disease is ever confined strictly to one of these three portions of the trophic unit. Ordinarily, however, they are chiefly confined to one portion, thus affording a basis of classification. There are cases on record which exhibited the symptomatology of amyotrophy and myopathy, or neural atrophy at the same time, and in which two or all three portions of the trophic unit were involved.

Symptoms.—The progressive muscular dystrophies appear before the age of 18, the majority before the age of 10. They are characterized by muscular weakness, and eventually by great muscular atrophy; but in the earlier stages apparent enlargement of certain muscles—pseudohypertrophy—is frequently seen. There are no mental or sensory symptoms, or these are rare or inconspicuous. Fibrillary twitchings, common in the amyotrophic form of progressive muscular atrophy, are, with rare exceptions, absent. The onset of the muscular weakness is insidious, and the shoulder or pelvic girdle or the legs are first affected. Unlike the spinal type of progressive muscular atrophy, the disease almost never begins with weakness and atrophy of the small muscles of the hand. The dystrophies belong to the so-called family diseases. Commonly two or more members of a family are affected. Boys are much more prone to be affected than girls. The hereditary influence is usually derived from the mother. The knee-jerks and the qualitative electric reactions are unaltered save in the late stages of the disease. The disease progresses until a stage of almost complete helplessness is reached. The weakness and atrophy become extreme, and various forms of club-feet and anteroposterior and lateral curvature of the spine are seen late in the disease.

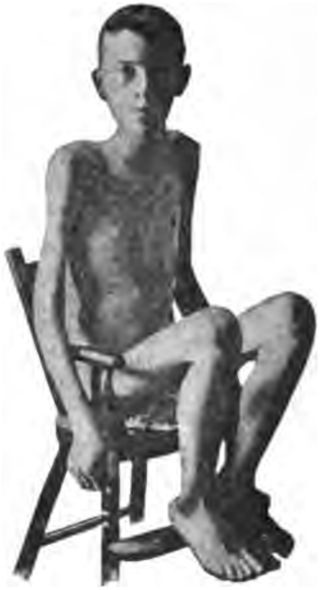
Types.—The different varieties of the muscular dystrophies have been much written about, but they are really unimportant. These different types depend upon the age at which the disease appears, and the parts first or most affected, and the distribution of the atrophy or hypertrophy. These so-called types are merely varieties of the dystrophies exhibiting superficial differences, and are not in any sense distinct diseases.

The fact that these various types run into or overlap each other, and that different types are seen in the same family, offer strong evidence in support of this view. For example, one of the two brothers shown in the accompanying illustrations represents one type, while the other brother represented another type or a mixture of two types.

The most important types commonly described are these:

1. Pseudomuscular hypertrophy.
2. Juvenile type of Erb.
3. Facioscapulohumeral type of Landouzy-Déjérine.
4. The atrophic form.

Pseudomuscular hypertrophy has, of these various types, been longest, and is best, known. It develops slowly, and begins usually before the eighth year. The first symptom noticed is some clumsiness in walking or running and in going upstairs, due to weakness of the muscles of the calves and of the extensors of the knees. The calf-muscles, although weakened, become hypertrophied. The infraspinati, the glutei, and the extensors of the knee also become hypertrophied. The lower half of the pectoralis major and the latissimus dorsi are wasted early in the disease. This hypertrophy may be very marked or only slight. Weakness of the muscles of the back, and of those which fix the pelvis upon the thighs, produce an anterior curvature of the spine (lordosis) which may become extreme, so that a perpendicular line, touching the spine between the shoulders, and striking the ground, passes 2 or 3 inches behind the sacrum. When the child sits down, this anterior curvature disappears and is replaced by a posterior curvature. The gait becomes more and more waddling as the disease progresses. Great difficulty is experienced in going up-stairs, due especially to the weakness of the extensors of the knees. In rising from the floor the child gets upon his hands and knees, then places one foot upon the floor, then one hand upon the knee, the other hand upon the other knee, and then, by successive movements, climbs up his own thighs in the characteristic fashion first described by Gowers. As the disease progresses, the hypertrophied muscles become atrophied. Contractures frequently occur, due to the overaction of



ERB'S TYPE OF PROGRESSIVE MUSCULAR DYSTROPHY.

certain groups of muscles which are no longer opposed by their normal antagonists. Thus various forms of club-foot are produced, especially talipes equinus. Contractures of the legs upon the thighs, and of the thighs upon the abdomen, occur, and may become extreme. Sensation remains normal. As a rule, no mental changes take place. Quantitative, but not qualitative, electric changes occur. The knee-jerks are preserved (never exaggerated) until the disease has made considerable progress. They fade out gradually as the disease progresses.

The juvenile type of Erb begins with weakness in the shoulder girdle. There is atrophy of the thighs and upper arms, while the forearms, hands, legs, and shoulders preserve their natural contour; indeed, there may be some hypertrophy of the deltoids, the calf-muscles, and the infraspinati. The thin upper arms and the thighs, along with the apparently well-developed forearms, deltoids, and calf-muscles constitute the striking picture which this type of dystrophy presents. This variety of dystrophy is well illustrated by the accompanying illustration. Eventually all the muscles become atrophic. Contractures of the legs and curvature of the spine occur, and the child becomes quite helpless. The later stage of this type of the disease differs little from that of pseudomuscular hypertrophy.

The facioscapulohumeral type of Landouzy-Déjérine usually begins in infancy. The distinguishing feature is the wasting and atrophy of the face-muscles, giving rise to the so-called myopathic facies. The face presents a mask-like appearance, and the lips are protruded and thickened, constituting the "Tapir mouth" (*bouche de tapier*). Neither the ocular muscles nor those of mastication or deglutition are affected. The atrophy extends to the shoulder and arm muscles. The features seen in the preceding type develop. It chiefly differs from the Erb type in that the face is involved and that the onset is at an earlier period of life.

The atrophic type presents the chief features of pseudomuscular hypertrophy, differing from that type mainly in that there is no hypertrophy, or apparent hypertrophy, at any stage of the disease. The muscles of the legs and back are first affected. The gait, according to Bramwell, is not so waddling as that of the pseudohypertrophic form; and he has described it as the "spider-crab" gait. This form is so nearly identical with the so-called Leyden type that the latter need not be described.

Course and Duration.—The dystrophies are essentially chronic in their course, which, however, varies greatly within certain limits. Ordinarily, patients live from 10 to 20 years; but a few cases have run a somewhat rapid course in 3 or 4 years. On the other hand, some patients have lived almost to old age. When the affection begins in early infancy, or the onset is rapid, the probabilities are that it will run a comparatively short course. The disease seems to progress more rapidly after the patient has become so weakened as to be practically helpless.

Etiology.—In about one-half the cases heredity has been traced, usually through the mother. The disease is so distinctly a family one that it must be concluded that its potential possibilities are contained in the germ-plasm. This, of course, implies some defect in one or both of the parents of a patient.

In the majority of cases the disease appears before the age of 10 years. Boys are much more frequently affected than girls; but in the Landouzy-Déjérine type boys and girls suffer about equally.

Pathologic Anatomy.—The primary seat of the disease is in the muscles themselves. The term "primary muscular dystrophy" is meant to carry with it this idea. The anatomic changes are practically the same in the different types. Slight changes have been found in the spinal cord, very different in degree and kind from those found in progressive spinal muscular atrophy of the Duchenne-Aran type. Nevertheless, the view is held by some that the dystrophies are nervous in origin, due to damage to the trophic centers which control the nutrition of the muscles. The primary changes are found in the muscle-fibers. Atrophied and hypertrophied fibers are found, the former predominating. There is proliferation of the nuclei, and vacuolation and segmentation of the fibers. Secondarily, there occurs proliferation of the connective tissue, multiplication of its nuclei, and increase of adipose tissue. The apparent increase in size of the muscles is chiefly due to these fatty and connective-tissue deposits.

Diagnosis.—The dystrophies are not difficult of recognition if the features which characterize them are known. In the following little table the chief diagnostic features which separate them from the spinal form of progressive muscular atrophy, with which they are most apt to be confounded, are enumerated, while those which characterize this last-named affection are placed in a parallel column.

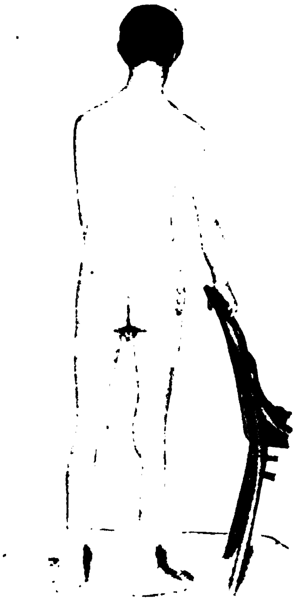
PROGRESSIVE MUSCULAR DYSTROPHIES.	PROGRESSIVE SPINAL MUSCULAR ATROPHY.
1. Usually more than one member of a family affected.	1. More than one member of the family affected very rarely.
2. Onset in childhood.	2. Onset in adult years.
3. Small muscles of hand almost never affected first.	3. Small muscles of hand affected first, as a rule.
4. Fibrillary twitchings rare.	4. Fibrillary twitchings usually present.
5. Enlargement of certain muscles very common.	5. No enlargement of muscles.
6. Qualitative electric reactions absent until late in the disease.	6. Qualitative electric reactions present.
7. Waddling gait and peculiar method of rising from floor.	7. Waddling gait not seen.

When only one member of the family is affected, the diagnosis may be difficult or even impossible; but usually the remaining features which characterize the disease are so plain that the diagnosis is not difficult even in the absence of this very significant feature. The slow onset, together with the features already named, should serve to distinguish the dystrophies from poliomyelitis. From multiple neuritis they are to be recognized by the absence of pain and tenderness, by the normal electric reactions, the presence of pseudohypertrophy, the age and manner of onset, and the family history. The various types of the dystrophies may be distinguished from each other by the points already enumerated. Sometimes this is easy, at other times difficult. These types overlap or run into each other more or less, and it is sometimes difficult or impossible to distinguish them from each other, nor is it especially important to do so.

Prognosis.—The prognosis is grave. The disease is progressive, and a cure is not to be expected. Patients may live 10 or 20 years. Those in whom the disease begins late in childhood or youth are likely to live longer than those in whom it begins in infancy. Rapidity of progress, of course, points to an earlier termination. After patients have become helpless, the progress of the disease becomes more rapid. The patient is likely to die of an intercurrent malady, such as pneumonia or bronchitis.

Treatment.—Members of dystrophic families should be strongly discouraged from marriage. Careful hygiene, with plenty of outdoor life, should be advised for the brothers and sisters of a dystrophic patient. Not a great deal is to be expected from the drugs, but more from a plan of treatment which includes outdoor life, with careful hygiene and measures calculated to promote the nutrition of the affected muscles, such as electricity, massage, and wisely regulated gymnastics. While a cure cannot be effected, the progress of the disease may, for a time at least, be stayed, or even a distinct improvement may be brought about by conscientious, intelligent, and persistent employment of these measures. Weiner has recently reported a case which was very considerably benefited by a systematic course of gymnastics lasting 2 years. While drugs have no special influence upon the disease itself, they may, from time to time, be indicated by the patient's general condition. In the later stages of the disease, after contractures have occurred, the orthopedic surgeon may, by performing tenotomies, produce very gratifying relief.

The Peroneal or Leg Type of Progressive Muscular Atrophy.—This affection, both in its symptomatology and pathologic anatomy, seems to stand midway between the dystrophies and the spinal form of progressive muscular atrophy. Commonly more than one member of a family is affected. The affection is, therefore, a hereditary or family disease. It begins in later childhood or youth by weakness and atrophy of the muscles of the feet and legs, usually in the former first. The atrophy and paralysis slowly and steadily increase, and, after 3 or 4 years, the upper limbs become involved, the small muscles of the hands being usually first affected, and then the muscles of the forearms. The supinator longus escapes, as do the muscles of the shoulder, neck, and face. The bird-claw hand seen in the spinal type of progressive muscular atrophy may be produced when the hand atrophy has become extreme. Patients rise from the floor by climbing up their own thighs, as do those affected with progressive muscular dystrophies; but as the disease progresses they become unable to rise from the floor at all; and this may occur before the arms have become appreciably involved, as is the case in the patient represented in the accompanying figure. Contractures of the muscles of the legs occur rather early, and produce talipes equinus or equinovarus. Fibrillary twitchings may occur, and slight sensory disturbances with pains are occasionally present. The powers of coordination are not only unimpaired, but rather increased. The patient may be able to walk long after he is unable to rise from the floor unaided, and when the slightest push suffices to upset him. The knee-jerks are diminished or lost. The affected muscles exhibit the electric reactions of degeneration. The affection has a tendency to follow acute infectious diseases.



THE PERONEAL OR LEG TYPE OF PROGRESSIVE MUSCULAR ATROPHY.

Patient aged 20. The legs are greatly wasted, but the arms are unaffected. A sister aged 25 suffers from the same disease in a more advanced form. Neither can rise from the floor unaided.

Only a few autopsies have been made. Changes in both the peripheral nerves and spinal cord have been found. Whether the disease is due to a neural atrophy or an amyotrophy, or to both, is not yet positively known. The disease is to be recognized by the family history of the patient, by the mode and time of life of onset, the absent knee-jerks, the changes in the electric reactions of the muscles, the fibrillary twitchings, the presence of club-feet, and, in the late stages, of the bird-claw hands. The course of the disease is slow, chronic, and progressive. Treatment is to be carried out along the lines laid down in cases of progressive muscular dystrophies and progressive spinal muscular atrophies.

MUSCULAR RHEUMATISM.—See RHEUMATISM (Muscular).

MUSCULAR SENSE.—The sensation by which we are aware of the degree of force exerted by contracting muscles. It differs from (1) pain on firm pressure; (2) pain on tetanic contraction (cramp), and (3) the sense of muscular fatigue. Disorders of this sense are those of hyperesthesia and anesthesia. Diminution is most frequent, with or without loss of voluntary power. Muscular anesthesia rarely requires special treatment. A sudden local loss of muscular sense requires rest and counterirritation, and is usually dependent on a local lesion in the cord. Faradization may be useful in some cases. See LOCOMOTOR ATAXIA.

MUSHROOMS, POISONING.—The most common fungus which gives rise to urgent symptoms of poisoning is the fly-fungus, or *Amanita muscaria*, the active principle of which is muscarin. Several other species of fungi possess poisonous properties. Severe cases resemble in their symptoms the algid stage of cholera; collapse, cyanosis, and muscular contractions preceding a fatal termination.

The stomach should be washed out immediately, if a siphon-tube or stomach-pump is obtainable; otherwise an emetic of apomorphin hydrochlorid, gr. 1/8, hypodermically; or of zinc sulphate, 20 grains in water, or mustard, 1/2 of an ounce in tepid water, or other emetic, may be administered. The physiologic antagonist of muscarin, which is atropin, should be given at once in the form of the tincture of belladonna, 20 minims in water, or injected hypodermically as atropin, 1/60 to 1/20 of a grain, and it may be repeated, if necessary. Castor oil is the best purgative, and should be given as soon as possible. When depression exists, stimulants in the form of brandy, ether, or ammonia may be administered. External heat is to be employed, and, for some days after symptoms have disappeared, the patient should remain in bed.

MUSK (Moschus).—The dried secretions from the preputial follicles of the musk-deer of Thibet, having an odor of marked penetrating power. It occurs in irregular, unctuous grains, of reddish-brown color and bitter taste. Its odor is destroyed by drying, but returns again on the addition of moisture. Trituration with camphor or hydrocyanic acid also destroys it. There is a variety known as Chinese musk which is very valuable when in pods or sacs, but all varieties are much adulterated. That sold in shops is impure, and if sold for less than 25 cents a grain, it is probably worthless.

It is a diffusible stimulant and supportive, an antispasmodic and nerve sedative. The dose is 2 to 6 grains, and is not to be employed save to carry a patient past a crisis. Rectal injections in starch-water may be used in low fevers, when the strength of a patient is fast failing, and there are nervous symptoms indicative of great depression. It is also of value in nervous excitement or nervous collapse.

Tincture of Musk, 5 percent. Dose, 20 to 80 minims.

A stimulant in croup:

℞. Musk,	gr. iv
Powdered white sugar,	ʒ j.

Divide into 6 powders; give 1 powder every hour or half-hour.

MUSSEL POISONING.—The toxic effects in man sometimes resulting from eating mussels, especially the *Mytilus edulis*. See FISH-POISONING, PTOMAIN-POISONING.

MUSTARD (Sinapis).—Official under the two following titles but the pharmacopœial preparations are directed to be made from black mustard only.

Sinapis Alba, *White Mustard*—the seed of *Sinapis alba*. Dose, as emetic, 1 to 3 drams.

White mustard contains *myrosin*, a ferment, and *sinalbin*, a crystalline substance, *sinapin*, an alkaloid, *erucic* or *brassic acid*, and a bland, fixed oil.

Sinapis Nigra, *Black Mustard*—the seed of *brassica nigra*. Dose, as emetic, 1 to 2 drams.

Black mustard contains *myrosin*, a ferment, and *sinigrin* (potassium myronate), *sinapin*, an alkaloid, *erucic*, or *basssic acid*, and a bland, fixed oil.

Sinapis is much used locally in the form of the well-known "mustard plaster."

A mustard plaster is a valuable counterirritant in the treatment of pain in the abdomen or chest. It should be made by mixing mustard flour in varying proportions with ordinary flour, and moistened by warm vinegar or water. Half mustard and half wheat flour will suffice if the skin is tender, but for children one-fourth mustard is strong enough. To make a mustard plaster, place a piece of heavy muslin or linen on a newspaper, over which smear the mustard mass. Over this a thin piece of linen should be placed, to prevent adhesions to the skin and to modify the irritant effect. The edges of a newspaper may be folded to resemble a picture-frame, and the plaster placed within this, giving it a support.

Mustard burns are peculiar in their slowness to heal, and in the fact that they are tender and reddened for days. When the burning is excessive, a piece of lint soaked in lime-water and olive oil, or in olive oil alone, may be used to give relief. Vaselin may be smeared over the burn.

Preparations.—**Oleum S. Volatile,** a colorless or pale yellow liquid, of pungent, acrid odor and taste and neutral reaction, almost insoluble in water but freely soluble in alcohol and in ether. Dose, 1/8 to 1/4 minim. **Charta S.** *Mustard Paper*, consists of black mustard, the fixed oil removed by percolation with benzin, mixed with solution of rubber and spread on paper. Each square inch should contain about 6 grains of mustard. For local use.

MYALGIA.—See RHEUMATISM (Muscular).

MYASTHENIA GRAVIS.—See PARALYSIS (Asthenic Bulbar).

MYCETOMA (Fungus Disease of India; Madura

Foot).—A tropical disease probably due to the vegetable parasitic fungus of the actinomyces group—streptothrix mycetoma. The seat of the disease is usually strictly localized in the foot, which becomes intensely swollen, deformed, and studded with cysts and sinuses which emit an offensive, oily, seropurulent fluid. Prophylaxis probably consists chiefly in the wearing of shoes. Treatment is solely surgical—amputation should be performed well above the diseased part, though in the early stages it may be sufficient to incise or remove with the curette all the diseased tissue.

MYCOSIS FUNGOIDES (Granuloma Fungoides).—A chronic, malignant, infectious disease, characterized primarily by an eruption of an urticarial, eczematoid, or lichenoid appearance, and later by ulcerating fungoid tumors. In the early or " premycotic" stage the affection begins as an urticarial, erythematous, eczematous, or lichenoid eruption, accompanied by itching and burning. After a duration of some months or years this is followed by flat or slightly elevated plaques of a pinkish-red color.

In the second stage there appear pea-sized to fist-sized, reddish or violaceous, shining tumors, which may develop from the above-described plaques or may spring up independently. They at times develop with remarkable rapidity, and spontaneously disappear just as quickly. More commonly they become an abscess, ulcerate, and present the appearance of a mushroom or fungoid growth. The microscopic appearance strongly resembles that of the round cell and lymphosarcoma. The result is almost invariably fatal.

To relieve the itching quinin and antipyrin have been found of value. Recently radium has been used with success.

MYDRIASIS.—See Pupil.

MYDRIATICS AND CYCLOPLEGICS. Definition.—A mydriatic is an agent which produces dilatation of the pupil. A cycloplegic is an agent which produces paralysis of the ciliary muscle of the eye. In ophthalmology these two terms are usually considered interchangeable, as the ordinary drugs possessing the power of producing mydriasis also produce, in a greater or less degree, cycloplegia.

The mydriatics which have been used in the examination of the eye are atropin, belladonna, homatropin, cocain, hyoscyamin, duboisin, daturin, scopolamin, muscarin, mydrin, euphthalmin, and ephedrin. Atropin and homatropin are the drugs usually employed in refraction, and are those to be recommended, as they have been extensively used and their action and dangers are far better understood than those of the newer substances.

Physiologic Action.—Atropin and homatropin produce mydriasis by paralyzing the sphincter of the pupil and stimulating the dilator at the same time. Cocain affects the dilator of the pupil chiefly, stimulating it. Atropin paralyzes the ciliary muscle completely, and leaves the eye adjusted only for the far-point. Homatropin paralyzes it less completely, but sufficiently for the purposes of refraction, when administered in the manner indicated. Cocain has a very slight paralytic action on the ciliary muscle. As usually administered, the effect of atropin lasts from 10 days to 2 weeks; of homatropin, from 1 to 2 days; of cocain, only a few hours.

Indications in Refraction.—In all first refractions of the eyes of persons under 45 or even 50 years of age, in whom there is no suspicion of glaucoma. No absolute diagnosis of the finer grades of astigmatism can be made without a mydriatic in a person possessing the power of accommodation.

Dangers.—These drugs may precipitate an attack of glaucoma in the eye of a person past middle life, or in whom there is already a tendency to increased intraocular tension. It has been said that if a mydriatic ordinarily applied for purposes of diagnosis produces glaucomatous symptoms, the patient would likely have been the subject of insidious glaucoma later in life anyway, and that the early diagnosis by the mydriatic facilitates treatment.

Mydriatics may also cause general toxic symptoms in susceptible patients. The general symptoms are tickling and dryness in the throat, vomiting, diarrhea, redness of the face, and quick and irregular pulse; even fatal cases have been recorded. If there is any history of idiosyncrasy, the patient should always be instructed to press the finger against the lacrimal sac for 10 minutes after using the drops. This danger may also be averted by using minute or divided drops of the solution. Congestion of the conjunctiva is often a temporary result of the instillation of a mydriatic. The systemic effects of a mydriatic may be combated with a full dose of paregoric.

Administration.—The most effective of this class of drugs, and that most frequently used, is the sulphate of atropin. A solution of 1 grain to 2 drams is ordinarily prescribed; 1 drop of this strength solution is placed in each eye 3 times daily for 2 days prior to the examination. An additional drop is generally applied at the office of the oculist before beginning the examination. For the reason of its prompt action and the short duration of its effect, the hydrobromid of homatropin offers a very efficient and necessary substitute for atropin in office practice. It is, however, a much more expensive drug than the sulphate of atropin. The best solution is a mixture of two-thirds hydrobromid of homatropin, 10 grains to the ounce, and one-third hydrochlorid of cocain, 10 grains to the ounce. A drop of the mixed solution is instilled in each eye every 10 minutes for an hour preceding examination. If it is necessary to have repeated examinations of the eye or to have prolonged mydriasis, atropin should invariably be used. Cocain is useful to dilate the pupil, to facilitate ophthalmoscopic or retinoscopic examination, but is valueless as a cycloplegic. The 4 percent solution is generally used. Sufficient dilatation is usually obtained in from 15 to 30 minutes.

Hyoscyamin, duboisin, daturin, and scopolamin are sometimes used, but investigation has not yet definitely established reason why they should be preferred to the older drugs.

MYELITIS.—An inflammation which affects the substance of the spinal cord, and which may be limited to the gray or white matter, involving the whole or isolated portions of the cord. When the gray matter alone is inflamed, it is termed central myelitis; when the white matter and the meninges, it is termed cortical myelitis. It may be ascending, descending, or transverse in its extension. The disease is characterized by more or less sudden and complete loss of motion and sensation. In the acute form the symptoms appear suddenly; in the subacute they develop in 2 to 6 weeks, in the chronic a longer time elapses.

Etiology.—It follows spinal meningitis; exposure to cold and damp; injuries to the vertebræ; tumors; caries; prolonged functional activity of the cord; typhus fever; rheumatism; syphilis; puerperal fever; or, during the course of the exanthems, arsenical or mercurial poisoning.

Symptoms.—The severity of the symptoms depends upon the extent and location of the inflammation. The onset is usually sudden, with a chill, fever (103° F.), frequent pulse, with alterations in sensibility and motility: pain in the back, aggravated by touch and by heat and cold, with sensations of formication ("pins and needles"), the limb feeling as if asleep, or else complete anesthesia, associated with severe neuralgic pains. The distinction between anesthesia (insensibility to touch) and analgesia (insensibility to pain) must be clearly determined. There is a sensation of constriction around the body and limbs, as if encircled by a tight cord—"the girdle pains"—and rapidly developing paraplegia, complete in a few hours, with involuntary discharges. The reflex functions are usually abolished, as seen by attempting to cause movement of the limbs by tickling the feet or by striking the patella tendon; rarely are they diminished, very rarely exaggerated. The temperature of the affected limbs is lowered 3 or 4 degrees. Sloughs and bed-sores and muscular atrophy result if the anterior cornua—the trophic centers—are affected. The foregoing symptoms, with rectal and vesical paralysis, are associated with more or less pronounced vomiting, hepatic disorders, irregularity of the heart, dyspnea, dysphagia, apnea, and painful priapism. The urine is markedly alkaline in reaction, finally developing cystitis. Among the late manifestations are shooting pains and spasmodic twitchings or contractions of one or all of the muscles of the paralyzed parts. The electrocontractility is abolished in the paralyzed parts.

Diagnosis.—**Acute spinal meningitis** is distinguished from acute myelitis by severe pains, increased by pressure, with muscular contractions, increased by motion,.followed by paralysis much less profound than the paraplegia of myelitis; in spinal meningitis there exists cutaneous and muscular hyperesthesia which is absent in myelitis.

Congestion of the spinal cord is characterized by the mild character and short duration of all the symptoms.

Hemorrhage in the spinal canal is abrupt, with irritative symptoms, slight paralysis, preserved reflexes, and electrocontractility.

The principal diagnostic points of acute myelitis are the "girdle" around the limbs or body, rapid and complete paraplegia, loss of sensation, lowered temperature in the affected parts, early and persistent sloughing (bed-sores), and alkaline urine or cystitis.

Hysteric paraplegia shows no trophic changes, no altered reflexes, slight atrophy, irregular anesthesia and the presence of the stigmata of hysteria.

Lithemic paresthesia, tingling and numbness of fingers and toes, might lead to error if the cerebral symptoms of lithemia are overlooked.

The diagnosis of the location of the lesion is made by a study of the height of the anesthesia, the skin reflexes, and the distribution and extent of the paralysis.

The following table by Morton Prince will be helpful in showing what portion of the cord is involved:

	LUMBAR MYELITIS.	DORSAL MYELITIS.	CERVICAL MYELITIS.
Paralysis	Paraplegia.....	1. Dorsal, abdominal, and intercostal muscles, according to height of lesion. 2. Leg.	Neck muscles, diaphragm, arms, trunk, and legs.
Sensation.	Pains in legs, or girdle pains around loins; hyperesthetic zone around loins; anesthesia of legs, complete or uneven distribution.	Girdle pain and hyperesthetic zone between ensiform cartilage and pubes.	Hyperesthesia and pains in certain nerve distributions of arms; below this, anesthesia of arms, body, and legs.
Atrophy.	Of legs.......	Of dorsal and abdominal (and intercostal muscles, not subject to examination) corresponding to height of lesion; sometimes mild and slow of legs.	Atrophy of neck muscles (rare) or more commonly of arms.
Electrical reaction.	Reaction of degeneration in atrophied muscles; or, in mild cases, quantitative diminution.	R. d. in dorsal and abdominal muscles; slight quantitative changes only in legs when wasted.	R. d. in atrophied muscles.
Bladder.	Incontinence from paralysis of sphincter.	Retention, or intermittent incontinence from reflex action; later from overflow. Cystitis common.	Same as in dorsal myelitis.
Bowels..	Incontinence from paralysis of sphincter, disguised by constipation.	Involuntary evacuation from reflex spasm, or constipation.	Same as in dorsal myelitis.
Reflexes, superficial.	Lost..........	Temporary loss, then rapid increase.	Same as in dorsal myelitis.
Reflexes, deep.	Lost..........	Temporary loss, then slow increase.	Same as in dorsal myelitis.
Priapism.	....	Often present...	Often present.

Prognosis varies according to the location of the lesion and the completeness of the symptoms. If the paralysis is of the ascending variety, death occurs within a few days, from paralysis of the muscles of respiration. If the trophic centers are affected, there occur bed-sores, intense pyelonephritis and cystitis, and changes in the joints, with death from exhaustion in several weeks. Central myelitis, or inflammation of the gray matter, is rapid in its progress, death occurring in a week or two. The morbid process may be arrested and the general health restored, but some spinal symptoms will persist.

Treatment.—Absolute rest is essential to secure even a palliation of the symptoms. Locally, considerable relief follows the use of hot-water bags, or sponges dipped in hot water, and applied along the spine every few hours. The remedies most strongly recommended are digitalis, strychnin, iron, mercury, and the iodids. Electricity is of little value. Cystitis and bed-sores must be guarded against.

MYELOCELE.—See SPINA BIFIDA.

MYELOMA.—The myeloid or giant-celled sarcoma. See SARCOMA, and BONE (Tumors).

MYIASIS.—See PARASITES (Animal).

MYOCARDITIS.—See HEART-DISEASE (Organic).

MYOCLONIA.—See PARAMYOCLONUS MULTIPLEX.

MYOMA.—A muscular tumor. Also an affection marked by the growth in the skin of small, sessile, freely movable, isolated, reddish tumors consisting of involuntary muscular fibers. If small and multiple, they are called liomyomata; if there is but a single large tumor, it is called a dartoic myoma; if the tumors contain much fibrous tissue, they are called fibromyomata; if vascular and erectile, angiomyomata; if the lymphatics are involved, lymphangiomyomata. See TUMORS.

MYOMECTOMY.—The excision of a uterine fibroid without removal of the uterus. This operation is applicable to certain classes of uterine fibroids. When the tumor is pedunculated and subperitoneal, the pedicle may be ligated in two parts and the tumor removed; if it has no pedicle, the capsule may be incised and the tumor enucleated. The uterine wound should then be closed with interrupted sutures.

The operation of myomectomy is of value when the conditions are favorable, since the patient is cured without removal of the uterus. A dangerous complication of myomectomy is hemorrhage. See UTERUS (Fibroma).

MYOPIA (Near-sightedness).—A condition of the eye in which parallel rays of light are brought to a focus in an eye at rest in front of the retina. It is most often dependent on the lengthening of the axial diameter of the eye, and such cases are called true or static myopia. A false or functional myopia is produced by spasm of the ciliary muscle, conic cornea, swelling of the lens in incipient cataract, etc. In such cases the sclera is of usual thickness, and the axis of the eyeball is not lengthened; the change is in the refractive media. See AMETROPIA.

Etiology.—It is rarely congenital, and, when so, it may be hereditary. An anatomic cause is said to be the peculiar construction of the orbit in certain persons. Devitalization and weakened resistance of the ocular tissues are predisposing causes. Scrofulous children are ready victims to myopia. The early necessity for increased convergence and accommodation by the precocious application of hyperopic eyes of childhood to continuous near-work produces a hyperemia of the ocular tissues, which, if of low resisting power, are stretched, the eye gradually becoming lengthened, and, as a result, myopic. Myopia is often seen in persons of intellectual pursuits requiring excessive near-work, such as students, artists, engravers, etc. However, in the congenital and hereditary types, the patients may be of the most ignorant classes of mere manual laborers. In such cases a low-grade choroiditis is an important etiologic factor. Myopia rarely results from an increased refractive power of the lens in the early stages of cataract in old persons, and to this fact may be possibly attributed the cases of so-called **"second sight,"** in which aged persons find themselves able to read again without their convex lenses. However, their distance-vision becomes markedly decreased. The entire eyeball is not necessarily involved in myopia: as, for instance, myopia results from the condition known as conic cornea, the relation between the retina and other media being normal.

An occasional and a curious cause of myopia is a marked decrease in weight of an extremely stout emmetrope or a low degree hyperope. In a like manner there has been noticed considerable decrease of myopia in persons who suddenly and markedly increase in weight.

Disadvantages and Dangers.—The axial diameter being too long, the parallel rays of light falling on the eye focus in front of the retina, and hence only a blurred image of external objects, is received on the rods and cones. In moderate hyperopia a similar defect is overcome by the accommodation, but the myopic eye possesses no mechanism adapted to the correction of the refractive error. There is no way of diminishing the refractive power of the dioptric system, and hence distant objects are always blurred. There is false estimation of size and distance, and altogether the myope is at a decided disadvantage in sports or occupations. However, the myope is still able to see near objects distinctly, and, unfortunately, therein lies his greatest danger. Deprived of many outdoor pleasures, he seeks occupation and amusement within his own limited circle of vision. By holding his book or implements close to his eye, he is able to see distinctly; but in so doing he strains his power of convergence excessively, producing ocular congestion and compression of the eyeball; and by bending over he affords a favorable position for the distention of the ocular veins. The coats of the eyeball, already of weakened resistance and put upon the stretch, are further pulled and damaged. The eyeball becomes more and more lengthened, and the myopia increases. With the stretching of the ocular coats the nutrition of the eye is seriously disturbed, and, as a result, the choroid becomes diseased, and this causes associate retinal changes, defective vision, even with proper glasses, resulting. The nutrition of the vitreous and lens is also seriously damaged. The consequences of such denutrition in the highly myopic eye are serious, and these eyes are liable to cataract, vitreous opacities, and retinal detachment. The danger is, of course, greatest in youth.

Contrary to the popular impression, the myopic eye should be considered as a "sick eye." However, if proper glasses are prescribed and constantly worn and excessive near-work interdicted, a moderate degree of myopia unaccompanied by posterior staphyloma is not liable to progress, but will remain more or less stationary through adult life. This again offers another argument for the early correction of myopia.

Another danger of excessive convergence in a myopic child is divergent squint. The strain in excessive convergence, necessitated by the diminished distance for near-work and extra effort to rotate the elongated eyeballs, may be so great that the effort to converge both eyes is finally relinquished, and one eye diverges.

A final danger of myopia is the liability to accidents on account of the inability to see distant objects clearly.

Progressive or **malignant myopia** is the serious type in which the ocular coats continue to stretch and become devitalized until they ultimately give way. The bulging occurs at the weakest portion, near the posterior pole, to the temporal side of the disc, and constitutes what is known as **posterior staphyloma.** The destruction of the choroid is accompanied by many conditions which are readily recognized through clear media with the ophthalmoscope. The **myopic crescent** is caused by the absence of the pigment of the stretched choroid and retina, usually at the nasal margin of the disc, allowing the sclerotic to show through as a white crescent. Other white spots indicative of chronic choroiditis may be seen scattered throughout the fundus. Hemorrhages and extravasations sometimes produce retinal detachment. In severe cases the vitreous becomes fluid and the eyeball soft. Vitreous opacity and luxation of the lens may result. With such serious sequels we readily see that the ultimate result of unchecked malignant myopia may be disorganization of the whole eye and total blindness; and in all cases of high myopia, whether progressive or stationary, there are pathologic changes of such import as to produce more or less amblyopia.

Symptoms.—The objective symptoms in the lower grades of myopia are of little importance. In the high degrees the eyeballs may be prominent, and when strongly converged, are seen to be elongated. In such cases the pupils are large and inactive. The myopic crescent and the choroidal condition help in forming the diagnosis.

The most noticeable subjective symptom is the interference with vision. In moderate myopia distant objects cannot be seen distinctly. Myopic children complain that they cannot see the clock across the room or distinguish writing on the blackboard at school, although they are able to read at close range with apparent ease. In extreme cases of myopia or in the progressive type the far-point is so close to the eye as to render the eye virtually useless for distant vision. Scotomata, limitation of the visual field, vitreous opacities, photophobia, photopsia, muscæ, and ocular pains are additional symptoms of the higher degree of myopia.

As a rule, the symptoms of accommodative asthenopia and the remote reflex irritations from eye-strain are not complained of in myopia, as the ciliary muscle is passive rather than active. Its radial fibers are better developed, and are greatly in excess of the circular fibers, the opposite of the condition in hyperopia. However, because of the strain on the convergence, evidences of muscular asthenopia, such as headache, weariness and sense of heat in the eye, and chronic conjunctivitis, may follow.

Diagnosis rests upon the diminished acuteness of distant vision, the ophthalmoscopic examination (refraction and fundus changes), the retinoscopic examination, and the acceptance of and visual improvement by a concave lens. Conic cornea is easily differentiated from myopia by the peculiar protruding appearance of the cornea, the depth of the anterior chamber, and the characteristic retinoscopic reflex. Hyperopia with ciliary spasm simulating myopia is readily differentiated under mydriasis. See RETINOSCOPY.

Treatment.—Prophylactic measures consist in the careful examination of children's eyes, particularly about the time they are to start to school, and in securing the best hygienic conditions for them during their school hours. Good ventilation, properly constructed desks, and sufficient and rightly directed light are requisites for the maintenance of normal vision. There should be a north light coming in over the left shoulder, and not falling directly on the desks. The walls and ceilings should be painted in light colors. There should be 1 foot of window space for every 5 feet of floor space, and small type should be distinctly read in the most remote corner of the school-room on a cloudy day. Books should be printed in large, broad-faced type, and on dull-faced paper. The desks should be sloping and so arranged as to avoid all stooping positions. In young myopes excessive near-work must be interdicted. Such children should be urged to forego studying, reading, and other indoor amusements, and must be encouraged to go out into the open air and take plenty of healthful exercise, meanwhile rigorously wearing their correcting glasses.

In myopia the book, writing, etc., should be placed at a distance of at least 13 inches from the eye, artificial or insufficient light should be avoided, and the eyes should be given frequent intermissions of rest.

In the progressive type of myopia, and in the extremely high degrees, near-work must be virtually excluded from the daily occupation. In such cases the treatment depends upon rest, abstinence from near-work, constitutional and hygienic measures, the relief of any increased ocular tension by the administration of eserin or by iridectomy, attention to the associate choroiditis and other pathologic changes, and the constant use of correcting lenses.

Prescription of Glasses.—Ordinarily, it is desirable to prescribe spectacles that will give fair distant vision and, at the same time, enable the patient to read easily at the proper working distance. However, in cases of persons doing much near-work, a pair of weak lenses may be ordered for reading, etc., and stronger glasses for outdoor use, theaters, receptions, etc.

In myopia of 3 diopters or over the far-point is inside of the ordinary reading distance, and there is necessarily extra convergence; but, unfortunately, there is no necessity for accommodation; the adductors are deprived of this stimulus, and exophoria results. In order to cause the requisite accommodative stimulus to the adductors, constant use of the full correction of myopia has been urged. The theory of this is plausible, but the strain on the undeveloped accommodation is too severe, and serious asthenopia results. Unfortunately, most myopes complaining of unsatisfactory glasses are wearing not only their full correction, but are, in a majority of cases, over-corrected. A myope will naturally select a strong lens, and caution should be observed in the trial with the test-lenses, accepting as the proper refraction the weakest lens which gives normal vision, and which does not diminish the size of the letters, and, as the patients so often say, makes them appear better but further away.

In prescribing glasses for constant use some deduction from the full correction should be made in cases of children and young adults, in order that compromise lenses may be continually used which give fair distant vision, but which necessitate only a moderate accommodative effort in reading. It must always be remembered that overcorrected myopia may produce as distressing symptoms as uncorrected hyperopia.

At the presbyopic age bifocal lenses should be constantly worn and the full distance-correction ordered in the upper segment. In the high degrees of myopia (above 6 to 8 diopters) the full correction is never tolerated. In the unfortunate cases of extremely high myopia (12 to 20 diopters), with extensive choroidal changes, glasses are often of little service in making a useful working eye, and are so bulky and heavy as to be uncomfortable.

Removal of the Lens for High Myopia.—It is a well-known fact that the removal of the crystalline lens makes an emmetropic eye hyperopic by about 10 or 12 diopters. In the knowledge of this fact it has been suggested that removal of the lens would be an advisable procedure in cases of extremely high myopia: for instance, of from 15 to 20 diopters. Although this operation has been performed a number of times, the actual practical results are not definitely settled; there is great danger of retinal detachment, and, moreover, it is too radical a treatment to be advised to the beginner in ophthalmology. An ideal indication for this operation would be lenticular myopia.

MYOSITIS, INFECTIOUS.—An inflammation of voluntary muscles due to obscure infection; it may be acute or subacute, purulent or nonsuppurative. It is characterized by tenderness, slight edema, and swelling. Frequently an erythema appears over the body. It is differentiated from trichiniasis by examination of the muscle fragments, and by blood examination (eosinopilia being present in trichiniasis).

MYOSITIS OSSIFICANS.—A progressive congenital affection, usually first manifested in boyhood, and seldom seen in females. Masses of bone develop in the muscles, chiefly those of the back, producing deformity, eventually impeding respiration and so causing death in about ten years. It is often associated with irregular epiphyseal ossification, and with the absence or ill-development of the proximal phalanx of the thumb and great toe. It is believed that the connective-tissue of the muscle undergoes ossification while the true muscle fibers atrophy, but the pathology of the disease is quite obscure, and no treatment is of avail. A similar condition known as **myositis ossificans traumatica** may develop after severe injury. It is most common in the quadriceps extensor group in the thigh and in the muscles of the arm. In this form the ultimate prognosis is good. Cases in which operation is done late, after the osteoid tissue has ceased to grow, do well as a rule, but if operation is done early there is a decided tendency toward recurrence (Finney). As a prophylactic measure incision, and evacution of the effused blood, with drainage of the affected area, is recommended.

MYOTICS.—See MIOTICS.

MYOTONIA CONGENITA (Thomsen's Disease).—A rare congenital disease appearing in early childhood and in family groups, characterized by tonic spasms of the muscles when voluntary movements are made. The muscles are developed out of proportion to their power.

The facial, ocular and laryngeal muscles are rarely affected. There is rarely mental defect. The electrical reaction of the muscles involved is slow and associated with vermicular contractions between the poles—the myotonic reaction of Erb. The disease is incurable.

MYRISTICA (Nutmeg).—The kernel of the ripe seed of *M. fragrans*. Its properties are due mainly to the volatile oil. It is an aromatic stomachic and tonic, and in large doses a powerful narcotic. Dose, 5 to 15 grains. The oil is sometimes employed as a rubefacient in paralysis and rheumatism, and is much used as a condiment. **M., Oleum,** the volatile oil. Dose, 1 to 5 minims.

MYRRH.—A gum-resin obtained from the *Commiphora myrrha*, a tree of Arabia. It occurs in dark-colored, brownish-red, irregular shaped tears, having an agreeable aromatic odor and a bitter acrid taste. In medicinal amount it is stimulant to the circulation, and to uterine and bronchial mucous membranes. Dose, 5 to 15 grains. **M., Tinct.,** diluted with water or with potassium chlorate, is used in ulcerative stomatitis, spongy gums, acute pharyngitis, and in ptyalism. It is combined with other remedies for the treatment of chronic bronchitis, and in combination with iron is efficient in functional amenorrhea. In leukorrhea and chronic cystitis it is of service.

The pure tincture is sometimes applied with a small brush to spongy or tender gums, and it is of use as a gargle in ulcerated sore throat. Dose, 10 to 30 minims.

In stomatitis:

℞.	Tincture of myrrh,	gtt. xx
	Potassium chlorate,	ʒ j
	Elixir of calisaya,	℥ iij.

Give a teaspoonful in water every 4 hours.

MYXEDEMA. Definition.—A disease characterized by the infiltration of the connective tissues of the body with a mucus-like substance and by atrophy of the thyroid gland.

Etiology.—The cause of the disease is the inability of the thyroid gland to perform its function, usually through atrophy. Rarely, it may be observed after removal of the gland. It is more common in women. Heredity is important, particularly in the maternal line.

Morbid Anatomy.—The connective tissue of the skin and subcutaneous tissues are infiltrated with a jelly-like substance containing mucin. The fibrillar and cellular elements of connective tissue are increased. Both of these processes may affect glands, muscles, nervous system, and the outer coats of the arteries. The thyroid gland is usually found to be atrophied.

Pathology.—With the atrophy or degeneration of the thyroid gland a hitherto undetermined something which is necessary for the well-being of the organism fails to be elaborated, and the changes enumerated occur. The secondary changes in organs result from the vascular degeneration.

Symptoms.—The face is swollen, rounded, with features less marked, and expressionless. The hands are spade-like and the feet misshapen; the body is bulky. The skin is thrown into folds, especially around the neck, and is dry, scaly, and thickened. The intellectual processes are sluggish, drowsiness is a quite constant symptom, and insanity often supervenes. The speech is slow. Myxedema in childhood, whether congenital or acquired, is termed cretinism. Subnormal temperatures, particularly in the later stages, are the rule.

Diagnosis.—The edema of chronic cardiac and renal disease is distinguished from this by the pitting and diminished hardness on pressure. The facies is not to be confounded with that of renal and cardiac disease, of which other physical signs are present.

Myxedema is distinguished from akromegaly in the great preponderance of instances in women, its development later in life, the absence of changes in bones, the full-moon face, the swollen and clubbed fingers, and the peculiar pale, waxy, boggy, and shining skin.

Prognosis.—The course of the disease is slow, and death from intercurrent affections is not unusual. Since 1892 the use of thyroid extract has modified the hitherto generally accepted opinion that the disease was of necessity fatal.

Treatment.—The patient should be protected from cold; hot baths, friction, and massage, with subcutaneous injections of pilocarpin, assist in maintaining the action of the skin. Inasmuch as the thyroid gland is found to be atrophied or degenerated in cases of this disease, and total removal of the gland is often followed by cachexia strumipriva (operative myxedema), the logical treatment consists in supplying to the organism that secretion essential to normal metabolism which in health is elaborated by the thyroid gland. The inconvenience of gland implantation, sheep's thyroids being used, is sufficiently obvious. The injection of minced, raw, or slightly cooked sheep's thyroids, although successful in ameliorating the symptoms of the disease, speedily produced an insurmountable repugnance to them, so that their use was very generally abandoned. At present the glycerin extract, powdered extract, or a presumably active principle of the gland are the only ones employed. The glycerin extract is given by the mouth in daily dose of from 15 to 30 minims, representing from one-eighth to one-fourth of an average sheep's thyroid. If this seems to be ineffective, the amount should be increased until evidence of betterment is obtained. The initial dose should be maintained at semiweekly or weekly intervals until all symptoms of the disease have disappeared. Inasmuch as the substance which the thyroid supplies is essential to the health of the organism, continual administration of the remedy is necessary during the remainder of the patient's life, but at more infrequent intervals. The powdered gland may be given by the mouth in such doses that from one-eighth to one-third of a sheep's thyroid is represented; in amount it is usually 5 grains. Inasmuch as the salts and extractives in the gland have been shown to be useless, attempts have been made to isolate the active principle and at the same time to get rid of the products of decomposition which may be harmful. Fresh thyroid gland contains but one iodin-containing substance —the colloid matter—which consists of a proteid part (possibly a globulin) combined with an organic compound of iodin (crude iodothyrin), and the latter can be separated from the colloid by hydrolysis. Since the specific effects of the thyroid gland can be obtained either from the colloid or the separated iodothyrin, the latter is now chosen for thyroid administration. At present there is no satisfactory way of standardizing the thyroid preparations, but the average dose of colloid matter is 1 1/2 grains.

On the administration of preparations of the thyroid gland in myxedema it has been found that untoward and even poisonous symptoms may arise. If, during its use, subnormal temperature, slow pulse, and mental hebetude are observed, the dose should be increased. Further, the dose should be larger in cold than in warm or hot weather. If, however, the pulse becomes quicker, evidences of circulatory disturbances arise, febrile reaction is marked, the patient becomes excitable, either the dose is too large or products of decomposition of proteid material are present as impurities. In the first case the dose should be diminished or the remedy stopped for a time; if the second, another preparation must be chosen. Symptoms of cardiac paralysis and circulatory disorder are more likely to occur in postoperative myxedema (thyroidectomy for goiter). In this instance the heart must be carefully observed, and at the first signs of failure the remedy omitted, while strychnin, strophanthin, or nitroglycerin is employed; a combination of the first and last is the most useful. Since most of the instances of the ill-advised use of thyroid extract have occurred in the practice of surgeons, it is proper that this phase of the treatment should be delegated entirely to physicians. With care in the use of preparations of the thyroid gland their administration may be safely continued during the life of the patient. For other precautions and accidents the reader is referred to THYROID TREATMENT.

MYXOMA.—A connective-tissue tumor the consistency of which is similar to the jelly of Wharton of the umbilical cord. It consists of a gelatinous, mucin-containing intercellular substance, in which are scattered peculiar branched or stellate cells. See TUMORS.

N

NABOTHIAN CYSTS.—See Cervix Uteri (Endocervicitis).

NÆVUS. See Nevus.

NAILS, DISEASES.—Affections of the nail may be divided into those of the nail proper, and those of the soft parts in relation with the nail. Alterations in the texture of nails are not common. Alterations in form result from injury or skin-disease. The general state of health influences the growth of the nails, and after illness a deficient formation of horny matter may result, manifested by the production of a groove across the nail. The breadth of this groove roughly indicates the period and duration of illness.

Onychia is an inflammation of the matrix of a nail. The best-known form is of syphilitic origin, and is either subacute or fully developed. The subacute form is attended with pain, redness, and more or less ulceration of the matrix. The developed form is met with in adults. The nail soon rots and crumbles away at the root, leaving a ragged border attached to the distal portion of the finger. The free edges also suffer, and become broken and fissured.

The treatment includes attention to the primary disease. Hot moist dressings or poultices are suitable in almost all cases of acute inflammations, and may be followed by soothing antiseptic lotions and ointments.

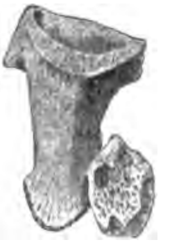
Carbolic acid, 1 dram, with water, 4 ounces, makes a soothing antiseptic lotion, which may be poured on lint and wrapped around the last joint of the finger. Chloral, 5 to 10 grains, with 1 ounce of water, may also be used. Finely powdered lead nitrate makes an excellent remedy. Ointments of boric acid, of tar, of mercury, or red precipitate salve may be used. A free application of a strong solution of silver nitrate at the beginning of the inflammation will often prove curative. When granulations spring up, they may be covered with tannin or alum, or rubbed daily with a crystal of copper sulphate, or strong carbolic acid or the liquor ferri persulphatis applied. In chronic inflammations of parts around the edges, daily painting with a solution of silver nitrate, 10 grains to 1 fluidounce, is useful. These measures failing, removal of the portion of the nail at fault or of the whole nail may be performed. Malignant onychia requires removal of the entire nail, cauterization of the matrix, and dressing with iodoform gauze, and the internal use of tonics and nourishing diet.

Syphilitic onychia is best treated with black or yellow wash, a weak solution of corrosive sublimate, by dusting with calomel, or by applying calomel ointment. Internal antisyphilitic measures are to be employed coincidently, and in strumous subjects constitutional treatment is also needed.

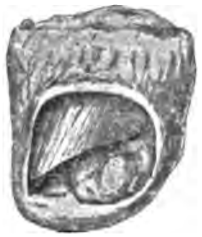
Paronychia, or whitlow, is an acute inflammation of the tissues around the matrix. It is generally of traumatic origin, and should be incised. In the milder forms the arm may be placed in a sling and the finger kept constantly wet with some weak antiseptic lotion, such as boric acid. Boric acid ointment may be used when the inflammation has subsided. Tonics, especially those containing quinin, are to be given internally. See Paronychia.

Ingrowing Nails.—Though occasionally on the fingers, ingrowing nails are most frequently found on the great toe, as the result of wearing tight boots and of cutting the nails square. A tight boot presses the skin over the sharp corner of the nail on each side, and ulceration ensues. There is lateral hypertrophy of the edge of the nail, or the soft tissues are forced over the margin of the nail. The pain caused by walking is often very severe.

Treatment.—In mild or trivial cases the trimming or clipping of the free margin of the nail, scraping of the dorsal surface with the edge of a bit of glass or with a knife, so as to reduce its thickness and to produce a tendency to curling upward or backward of its lateral margins, and the removal of any cuticle accumulated under the ingrowing edges of the nail are all that is required to give relief and prevent further progress. Pressure must be avoided. When ulceration has occurred, a minute roll of lint shreddings should be neatly packed beneath the tender overhanging skin and ingrowing edge. Strapping is then so applied as to retain the lint and drag upon the overhanging integument and keep it pulled away from contact with the ingrowing edge. The lint may be removed in a few days and the space filled with boric acid, iodoform, lead nitrate, alum, or zinc oxid. Exuberant granulations may be destroyed by silver nitrate, copper sulphate, perchlorid of iron, or pure carbolic acid. Repeated applications may destroy the sharp ingrowing edge of the nail.



Subungual Exostosis of the Great Toe.—(*Spencer and Gask.*)



The End of a Great Toe to Show the Characteristic Appearance of a Subungual Exostosis.—(*Spencer and Gask.*)

Under local anesthesia the nail may be split, the offending portion removed, together with the soft tissue and the adjacent matrix, and the wound antiseptically dressed. A somewhat popular operation is to remove a V-shaped piece of the side of the toe in which the nail is ingrown, including in the V the section of offending nail. The cut surfaces are drawn together with sutures, and the wound is dressed antiseptically.

Subungual exostosis forms a painful swelling which raises the middle while the two sides of the nail are unaltered. It generally affects the great toe. Complete removal of the ungual phalanx with the nail and nail-bed is the only satisfactory measure, the plantar surface being turned over as a flap.

NAPHTHALENE, Naphtalin. $C_{10}H_8$.—A hydrocarbon obtained from coal-tar, formed during the manufacture of ordinary coal gas. Chemically, it is one of the benzene derivatives. When redistilled, it crystallizes in colorless, rhomboid plates, of slightly tarry but strong odor, and burning, aromatic taste; insoluble in water, soluble in 15 of alcohol, very soluble in boiling alcohol, ether, chloroform, carbon disulphid, and fixed or volatile oils. It is seen frequently in the form of moulded blocks, under such names as *alabastrin* and *camphylen*, for preserving furs and flannels from moths, and for disinfecting urinals. Dose, 1 to 3 grains, in emulsion, or as a powder with sugar in wafers or capsules.

Naphthalene is employed as an antiseptic for the intestinal canal in typhoid fever, diarrhea, both acute and chronic, tuberculous diarrhea, and dysentery. It renders the urine aseptic and may be employed in vesical catarrh. It is used internally for bronchial asthma, verminous affections, the chronic pulmonary catarrh of the aged, and chronic bronchitis with copious secretion. It is said to be effective as a teniacide, also as a vermifuge for seat-worms given by injection, 15 to 30 grains in 3 ounces of olive oil. Burned in the patient's room it has given excellent results in pertussis, giving force to the belief that the well-known benefit resulting from taking children to gas-works for whooping-cough is due to the naphthalene fumes rather that to those of the gas-tar. Locally, naphthalene has high value as an antiseptic for indolent ulcers, sloughing wounds, open cancers, and pus cavities. Painted over organic remains it effectually prevents the ravages of insects, and has largely supplanted camphor for protecting woolen clothing from moths.

NAPHTHOL (Beta-naphthol).—A phenol occurring in coal-tar, but usually prepared from naphthalene. It is one of several naphthols, and occurs in colorless, shining, crystalline laminæ, or a whitish, crystalline powder, of faint, phenol-like odor, and sharp taste. Soluble in 3/4 of alcohol, in about 1000 of water, and in 75 of boiling water; very soluble in boiling alcohol, ether, chloroform, olive oil, and petrolatum. Used as ointment, 1 to 5 for adults, but for children it should not be over 2 percent strength. Dose, 3 to 6 grains in cachet or pill.

Beta-naphthol is used in the form of a 2 percent soap in prurigo, herpes, ichthyosis and favus, also in a 1/2 to 5 percent alcoholic solution, or as a 10 percent ointment, for hyperidrosis, scabies, and eczema, but it is a dangerous and irritant application. Internally it has been employed in typhoid fever, dilatation of the stomach, intestinal dyspepsia, diarrhea and dysentery. Its germicidal rank is probably second to many other agents, but it is an efficient internal antiseptic, being practically nontoxic in medicinal doses. Dose, 3 to 6 grains.

NARCOTICS.—See HYPNOTICS; LAMBERT TREATMENT FOR NARCOTIC ADDICTION.

NARCOTIN.—An alkaloid of opium, said to be sudorific and antipyretic, but it has no narcotic or hypnotic effects. Dose, 1 to 2 grains. See OPIUM.

NARGOL.—A compound of silver and nucleinic acid, containing 10 percent of silver, used in 1 to 5 or 10 percent solutions. It is more stable than protargol and less irritant in solutions of equal strength.

NASAL BONES.—See NOSE (Injuries).

NASAL DISEASE.—See NOSE (Caries); RHINITIS.

NAUSEA OF PREGNANCY.—See PREGNANCY (Diagnosis, Pernicious Vomiting).

NAVEL.—An oval fossa of variable depth on the median line of the anterior abdominal wall. The cicatricial eminence at its bottom indicates the place where the umbilical cord was detached. See UMBILICAL CORD.

NEAR-SIGHTEDNESS.—See MYOPIA.

NECK, INJURIES.—**Burns** are particularly serious on account of the swelling and the edema of the larynx which may complicate them. Even when no deeper than the skin, they result in cicatrices which are most deplorable because of the appearance of the parts and because of the deviations they cause, sometimes binding the chin down to the sternum; for this reason they should be grafted at the earliest possible time. Deep burns extending to the muscles and to the vessels are most serious, even when limited, for obvious reasons. The cicatrices pass into keloids more often than in other regions.

Contusions are not frequent; they are usually produced by falls, blows, hanging, garrotting, throttling, the passage of a wheel over the neck, or by the pressure of the dislocated clavicle. A blow on the side of the neck is a great aim with pugilists, because it is almost a sure knock-down or knock-out; it is often grave in its results, because of the importance of the organs of the neck, and may be accompanied by fractures of the hyoid bone, larynx, and trachea, injuries to muscles, vessels, nerves, pharynx, esophagus, vertebral lesions, concussions, and contusions of the spinal cord; hematoma may form and become large and cause grave pressure-symptoms on all the structures. Death may occur after a few days from edema of the lungs; also from embolism from one of the large vessels of the neck.

Wounds of the neck are comparatively rare in civil practice; sometimes they are accidental and due to a fall on a fragment of glass, a stem of iron or wood; they are most commonly due to attempts at murder or suicide. Suicidal wounds are the most common and the most interesting. The wounds are penetrating or nonpenetrating according to whether or not they reach the trachea, or the esophagus, or the vessels. **Superficial** or **extrafascial wounds** of the neck—*i. e.*, wounds not extending beyond the superficial cervical fascia—present nothing peculiar. However, a large incised wound of the external or anterior jugular, especially if these veins happen to be unusually large, may give entrance to air. In tracheotomy the anterior jugular and the inferior thyroid veins are often wounded. If the parallelism of the lips of the wound has been disturbed, there may be much infiltration of blood; this requires enlargement of the incision and ligation, in preference to pressure; cellulitis spreads rapidly.

Gunshot wounds are rare, yet there are instances when a bullet has traveled under the skin and above the fascia without penetration of the fascia. **Contused** and **lacerated wounds,** if extensive, may be followed by cicatrices and their consequences. **Gunpowder stains** should receive as careful attention as those of the face, especially if in the exposed parts of the neck. Gunshot wounds causing much destruction of skin present the same remarks as the lacerated wounds.

Deep or **subfascial wounds**—that is, wounds extending beyond the cervical fascia, and more or less deeply—are almost all very serious because of the almost invariable injury of some of the large vessels and nerves, or of the special organs of the neck, larynx, trachea, pharynx, and thyroid body, giving passages to air, food, and blood, each of which calls for special treatment.

Complications of the wounds of the neck are the following: Thrombus or extravasation of blood, due to the loss of parallelism of the lips of the wound through the various layers; entrance of air into the veins, more frequent and dangerous here than anywhere else; passage of food through the wound and into the larynx or trachea; hemorrhage, more or less profuse, according to the vessel injured and its accessibility; emphysema, due to injury of some point of the respiratory tract with a gravity greater than in any other region on account of the involvement of the arytenoepiglottic folds and the consequent obstruction of the larynx; aphonia from injury to the vocal cords or to the nerves; emphysema, edema, penetration of blood in larynx, or injury of the pneumogastric or laryngeal nerves; dyspnea due to the same cause, plus injury to the phrenic; dysphagia, due to swelling or pain; erysipelas is a frequent complication, as is pyemia or sepsis; edema of the glottis is very common; spasmodic croup, due to pressure or to nerve injury, is not rare; concussion of the cervical column communicated to the spinal cord, to the pneumogastric, phrenic, cervical plexus, and brachial plexus has been observed in severe wounds.

The symptoms of entrance of air into the veins are a wind-sucking or gurgling sound, immediate pallor of the face, dilatation of the pupil, irregular or tumultuous action of the heart, embarrassed breathing, and death. The wound should be plugged at once with the finger, and all the usual means of resuscitation vigorously and persistently applied. The amount of air introduced is a grave factor. If the wound is small, the operation may be continued by keeping the wound constantly filled with warm sterilized water.

The sequels of the wounds of the neck are: permanent aphonia or dyspnea or dysphagia, necrosis of the cartilages and of the hyoid bone; torticollis due to contraction of cicatrix, to inflammatory adhesions of the muscles, or to nerve injury; fistulous tracts; granulations obstructing the respiratory tract.

Deep punctured wounds striking the large vessels are those which are most commonly followed by deep and extensive extravasation and traumatic aneurysms; they call for the ligation of the two ends of the wounded vessels; it is here that a proximal loop ligature of the main trunk, low down when practicable, will be of the greatest assistance in controlling the hemorrhage during the search for the bleeding ends. They are also more commonly followed by emphysema than the incised wounds. When they involve a nerve, they may cause tetanus or spasmodic croup. **Deep incised wounds** are often rapidly fatal from the extensive hemorrhage, because it is rare that some artery or vein has not been opened; the same remarks apply here as applied to their treatment. **Deep contused and lacerated wounds** present here no special peculiarities not covered by the foregoing descriptions and the description of these wounds in general.

Gunshot wounds usually cause much hemorrhage; they sometimes recover most unexpectedly; of course, their gravity varies with the injuries inflicted. When the ball is deeply seated, no dissection should be made to extract it until later, if it produces disturbance. See GUNSHOT WOUNDS.

Poisoned wounds—*i. e.*, bites, stings—are more frequent on the neck, on account of its exposed condition; also more grave, because no clothing has protected the parts; also because they are usually followed by great swelling, which, reaching the arytenoepiglottic folds, causes obstruction of the larynx. Bites of a rabid animal are more serious, because they have a shorter distance to travel to reach the central organs of innervation, and because no clothing has wiped the animal's teeth.

Foreign bodies in wounds of the neck are common—wadding, pieces of clothing, piece of the weapon or bullet, etc.

Fractures of the neck are rare. See SPINE.

Dislocations and **sprains** are the result of injuries in which the head is much stretched, most commonly and especially when violently striking first upon the vertex; they give rise to great pain, particularly when the head is thrown backward. The treatment consists in thorough rest of the part by lying on a bed or by applying a liquid glass bandage.

In all injuries of the neck causing obstruction to the free circulation of the air, from whatever cause, there are great dyspnea, cyanosis, anxiety, rapid pulse, aphonia, dysphagia, and pain. Tracheotomy should be performed in such cases, and it is often advisable to operate before urgent symptoms present themselves, for death may come on rapidly or suddenly before the patient can be reached.

Peculiarities of the Injuries of the Infrahyoid Region.

Burns and the **effects of cold** are only peculiar in the possibility of being followed by cicatrices which bind the neck and chin down to the sternum in a very peculiar manner.

Contusions.—On account of the presence of the larynx and trachea, they may be followed by great concussion effects altogether out of proportion to the severity of the blow. Contusion of the thyroid cartilage by a blow upon and close to it may cause death without any appearance of a lesion. Contusions may cause rupture of the larynx and trachea. In hanging the compression very often bears upon the base of the tongue, and the larynx, with its vessels and nerves, is not injured. In strangulation when the traumatism is applied upon the larynx and the trachea, which may be torn by the fingers and the rope, all the structures are more or less torn. In some cases lesions of the skin of the neck, of the trachea, and of the larynx may cause inhibition of the heart, of the respiratory organs, and of the brain.

It is especially in case of traumatism of the anterior region of the neck that a complete loss of consciousness and a respiratory and cardiac syncope are observed. This takes place in cases of death through incomplete hanging, which does not prevent the passage of air through the respiratory passages. In such cases the red blood of the arteries continues red in the veins, whereas in death by true asphyxia the blood becomes rapidly black in the arteries.

Accidental wounds are rare; the most frequent are punctured wounds, resulting from a fall on a sharp body.

Homicidal wounds are not so rare; they are usually incised wounds, and a cutting instrument is used by the criminal to make believe they are self-inflicted or accidental.

Suicidal wounds are the most frequent; they are seldom punctured; they are usually incised wounds; they are most frequent at the point of the thyrohyoid ligament or below it; they are lacerated, jagged, deeper on the left side; they are usually directed from left to right, and obliquely downward or transversely across the neck; the large vessels are seldom injured. Usually the suicide, throwing his head back, cuts too high; the trachea and the rigidity of the sternomastoid protect the vessels. If the head is bent too much, the larynx, the trachea, and the sternomastoid also protect the vessels. There is usually a single gash. These wounds are more commonly fatal than the other wounds, because the victims are usually intoxicated or are laboring under delirium tremens or insanity. These patients should be watched closely, as they often tear away their dressings and die of hemorrhage. These wounds sometimes present much hemorrhage, although none of the larger vessels are hurt, except the anterior jugular vein; there are cases on record where air has penetrated into it and to the heart, causing death. The edges of these wounds are often much separated, and have a tendency to roll in on account of the action of the fibers of the platysma; coaptation, therefore, needs more care.

Lacerated wounds are very rare.

Gunshot wounds are also rare. Balls may traverse the neck without wounding any important structures, because the tissues are round in form, elastic, and movable.

Bites by dogs are comparatively common; the anterior region of the neck is the favorite aim of dogs, especially the bulldog; they cause all the lesions of strangulation and of incised wounds.

Nonpenetrating wounds—*i. e.*, not involving the larynx, pharynx, esophagus, or recurrent nerves—are not peculiarly serious and should be treated as elsewhere, taking care to secure the divided vessels, etc.

Punctured wounds, especially in duels, may penetrate into the mouth, pharynx, esophagus, larynx, or trachea; it is important to look for such penetrations, and to keep the parts as thoroughly disinfected as possible, because there is often risk of infection of the wound from within. The landmarks are the hyoid bone, the thyroid and cricoid cartilages. The laryngoscope should be used.

Penetrating wounds, due to any cause involving the respiratory or digestive tract and the recurrent nerve, are, of course, severe.

Penetrating wounds above the larynx are less dangerous than those of the larynx and those below it; the lower the wounds, the more dangerous they are.

Wounds through the thyrohyoid membrane penetrate into the pharynx, injure the epiglottis, the arytenoepiglottic folds, the cartilages, and the vocal cords; they are less dangerous than below because they allow feeding; they are more liable to suppuration.

Wounds of the larynx are comparatively frequent because of its prominence; they are usually very dangerous, and may be diagnosed by the rushing sound of the air passing through. They should be treated like those of the trachea.

Wounds of the trachea are commonly followed by severe hemorrhage, because of the large vessels around it, which may also have been wounded by the same cause. When the severance is incomplete, there is slight gaping; when the section is complete, the lower end is drawn in deep at each effort of respiration, and the soft parts cover up the orifice, causing suffocation. In all cases keep the blood and foreign substances out of the respiratory tract until hemorrhage is checked. Rose's position may be of assistance.

In **incomplete wounds** there is slight gaping, and the wound should not be stitched; the head should be flexed on the chest and fixed in that position by a liquid-glass bandage.

In **complete wounds**, when longitudinal, there is little gaping. In complete transverse wounds the retracted lower end should be searched for and a strong thread passed deeply through it; an attempt at stitching should be made; if it fails, a tracheotomy tube should be placed in it and it should be longer than the ordinary one, because the swelling may lift it out of the trachea; the head should also be kept flexed; a moist cloth should be placed over the tube; the room should be warm—at about 70°—and a vessel with boiling water should keep the atmosphere moist, to avoid bronchitis and pneumonia. Later, we should be mindful of the exuberant granulations which may obliterate the canal.

The sequels of wounds of the air-passages are permanent contractions of these passages, aphonia, fistulous orifices, entire occlusion of larynx, the air passing through the external wound. Fistulæ are hard to cure.

Wounds of the pharynx and **esophagus** are usually through the side of the neck, by balls, knives, etc.; they cause much pain, spasms, hiccup, dysphagia, and more or less suffocation; there is escape of food through the wound, if this is of a certain size; the thirst is great. The patient should be fed by enema; if the use of the esophageal tube becomes necessary, from insufficiency of the rectal alimentation, it should not be left in place, but introduced each time. In incised wounds stitch immediately; in lacerated wounds let the wound granulate.

Rupture of the esophagus from contusions is rare; the special symptom is hematemesis. When the diagnosis is sure, cut down upon the injured spot along the anterior edge of the sternomastoid; stitch the wound if possible; if not, pack and let it granulate.

The immediate dangers of wounds of the anterior region of the neck are death from hemorrhage—although the hemorrhage stops from syncope, it may start again later—from asphyxia, due to the tongue or epiglottis or a piece of cartilage obstructing the passage, or to blood and clots in the larynx and trachea; from penetration of air in the veins. Penetration of the respiratory tract is recognized by cough, blood expectoration, hissing or boiling sound.

The secondary dangers are inflammation of the larynx, edema of the glottis, bronchitis, pneumonia, abscess and purulent dissections, emphysema, aphonia, more or less complete, and dysphagia; secondary hemorrhages are common and serious complications. In all injuries with solution of continuity of the mucous membrane the most frequent source of death may be mediastinal emphysema and inhalation pneumonia.

Wounds of the neck parallel to the longitudinal fibers of the muscles are more likely to be followed by emphysema. The remote effects and sequels may be exuberant granulations causing dyspnea; cicatrization, producing strictures of the larynx, trachea, and esophagus; persistent fistula; paralysis due to inflammatory thickening, which may disappear later, or to injury of recurrent nerves or the pressure of a bullet. All these complications should be treated here as elsewhere.

Dislocation of the hyoid bone is very rare. There is one case (Gibb) in which the dislocation was muscular; it was accompanied by a peculiar click on the left side of the neck and a sensation of choking; examination showed displacement of the left horn of the hyoid bone; reduction was effected by throwing the head backward toward the right side, so as to stretch the muscles of the neck, and then suddenly depressing the lower jaw, thus bringing the depressors of the hyoid bone into action.

All the following fractures are usually due to violent contusions:

Fracture of the hyoid bone is rare, but it is well known; the site is usually the great horn, near the body; it may be unilateral or bilateral; it is characterized more or less by hoarseness and dysphagia, according as it is without or with displacement and without or with deformity; accompanied by more severe symptoms, especially when swallowing fluids, which pass into the larynx because of the imperfect action of the epiglottis; it is reduced by using the fingers inside the oral cavity.

Fractures of the larynx are less rare than fractures of the hyoid bone; they are due to great violence; they are usually accompanied by much pain and suffocation, often calling for immediate reduction or for tracheotomy. Each cartilage may be fractured by itself; the thyroid is most frequently the site; fractures without displacement are not so grave. Fracture of the thyroid cartilage is more common in old people, because of the ossification of the cartilage. Fracture of the cricoid is more dangerous than the others, perhaps because of its small size, which causes slight displacement to be followed by serious obstruction.

Fractures or subcutaneous ruptures of the trachea without actual wound have been observed after great traumatism; they are less frequent than the others; they present the same symptoms and indications as the fractures of the larynx, but the lesions are lower down. The trachea should be opened below the fracture, and a long tracheotomy tube be introduced; when the fracture is low down, the lower end should be hooked, raised, and sutured to the skin or upper fragment.

Spontaneous ruptures of the trachea due to violent efforts are admitted by some. All these fractures are more serious if accompanied by displacement which obstructs the air-passages. The symptoms are those of obstruction and shock, in addition to those of fractures in general; crepitation, abnormal immobility, and also aphonia, dysphagia, and emphysema. The fragments should be replaced by external and internal manipulations; if necessary, the parts should be incised and the fragments stitched. Tracheotomy is often indicated; it is well to perform the operation before grave symptoms develop, because these sometimes come on so suddenly that the patient may succumb before operation is possible. See LARYNGOTOMY, TRACHEOTOMY.

Peculiarities of the Injuries of the Thyroid Body.

Burns and **freezing** are only observed in cases of great and deep destruction of the neck.

Contusions are most common in all cases of much violence to the neck—as has been described—coexisting or not with fractures of the hyoid bone, larynx, and trachea. The peculiar features they present are symptoms of cerebral congestion, and also the fact that they may be followed by myxedema.

Wounds of the thyroid body are likely to be serious on account of the great vascularity of the organ and its friability; the bleeding is usually great, especially if breathing is obstructed or laborious.

Punctured wounds are rare in the normal thyroid body, but are comparatively frequent in the hypertrophied organ or goiter, and, if deep, give rise to serious hemorrhages.

Incised wounds are usually suicidal; those of the upper angles are the most frequent and the most serious, because of the presence of the superior thyroid artery; in goiters they suppurate, as a rule, and usually run a benign course.

Lacerated wounds are not ordinarily followed by primary hemorrhage, but may present serious secondary hemorrhage.

Gunshot wounds call for the same remarks; the thyroid gland has been carried away by a missile. Treatment of hemorrhage is difficult because of the friability which will not allow a ligature to hold tight enough to arrest the bleeding with safety against secondary hemorrhage. The same remarks apply to the forceps left *in situ*. Deep suturing succeeds best, or a chain ligature or a purse-string ligature. A pin or needle suture, such as is used for harelip, sometimes succeeds; pressure is not borne; it is useless to ligate the nearest trunk because the other vessels will keep up the hemorrhage; when the bleeding is serious, tracheotomy, if practicable, sometimes stops the hemorrhage by relieving its congestion; in spite of all, death is sometimes the result of hemorrhage.

As regards **foreign bodies in wounds,** there is not a case on record where a bullet was found buried in a normal thyroid body. Poisoned wounds, bites, and stings are rare, except in conjunction with such in the infrahyoid region.

Peculiarities of the Injuries of the Suprahyoid or Submental Region.

Burns are of peculiar importance, because the resulting cicatrices may draw the skin of the chin and of the lower lip, causing eversion of the lips and its consequences.

Contusions in this region are rare, because of the protection of the chin. In hanging the compression may often bear on the base of the tongue; the vessels, nerves, and larynx are uninjured.

Wounds of the suprahyoid region are very seldom homicidal, but almost always suicidal. **Penetrating wounds** only are of importance; punctured wounds are very rare; they are only observed in the cases of "hooking" of the chin. **Incised wounds,** when transverse, usually gape a great deal, but very little when longitudinal; usually the suicide, throwing his head back, cuts higher than he intends in the suprahyoid region, so that the borders of the stretched sternomastoid protect the vessels. The penetrating wounds open the cavity of the mouth, injure the tongue and epiglottis; there may be suffocation due to the blood or other foreign substances, or to the tongue or epiglottis falling back and occluding the larynx; there is usually much hemorrhage from the wounding of the lingual artery. More than in all injuries of the neck swelling and edema of the arytenoepiglottic folds, which are directly injured, are here met. The gaping is especially great when the head is thrown back; the saliva and food pass out of it during deglutition. Wounds of the epiglottis cause much suffocation, difficulty of speech, of deglutition, and coughing; thirst is a common symptom. **Lacerated wounds** have been observed in several cases of "hooking" of the chin.

Gunshot wounds seldom penetrate posteriorly, because the head, being usually thrown back, the revolver is naturally directed upward and rests under the chin, which is usually carried away by the shot.

Poisoned wounds, bites and stings present nothing peculiar. Foreign bodies in the wound are alimentary matter. The shock is as great as in all injuries to the air-passages, on account of the dyspnea and aphonia and dysphagia.

Peculiarities of the Injuries of the Submaxillary Region (Lateral Suprahyoid or Digastric Triangle).

These injuries present some peculiar interest because they may injure the facial or the lingual artery, or the hypoglossal nerve, and also because they may penetrate into the mouth. In regard to the diseases of the deep parts, it is well to state here at the outset, and to bear in mind, that the overlying lymphatic glands are more often affected than the tissue of the submaxillary salivary gland itself, and that practically it is immaterial which is involved.

Peculiarities of the Injuries of the Parotid Region.

Wounds.—Injuries of the parotid region are rare; they are grave, on account of cicatricial disfigurements and injuries to the facial nerve and to Steno's duct. **Punctured superficial wounds** are of no consequence, nor are the deeper wounds, unless the instrument is large and the great vessels are injured. **Incised superficial wounds** may injure the facial nerve and the duct, and may be followed by paralysis; when large, the divided nerve and duct should be at once stitched. Incised deep wounds are most serious. The diagnosis of the penetration of the gland rests upon the escape of saliva. When the wound is narrow, the hemorrhage and, later, the suppuration prevent the diagnosis; if the pus is very liquid, it is probable the gland is seriously injured. To prevent fistulæ stitch tightly and keep the jaw at rest. **Deep wounds** are more serious, because of the presence of the temporomaxillary vein, which becomes the external jugular; also of the other deep vessels. The bleeding is profuse and sometimes appalling; it should be at once stopped by plugging; then a provisional loop ligature should be applied on the common carotid close to the bifurcation; the bleeding points should then be ligated. If this fails, the source of the hemorrhage should be carefully determined. If it is the external carotid, ligate it; if the internal carotid, ligate it separately or ligate the common carotid at the bifurcation to prevent the return through the collateral circulation. If the jugular vein is injured, ligate it as high up as possible, at least above the facial and lingual, or ligate there. After the ligation or ligations have been done, the accidental wound should be packed tightly with bits of aseptic sponges to prevent hemorrhage by the distal end of the vessels. This plugging will usually accomplish this, but plugging should never be relied upon if the trunk has not been ligated. The hemorrhage is almost sure to recur, and often the patient thus loses so much blood that when the ligations are at last performed, he succumbs to hemorrhagic anemia. When the hemorrhages are unmistakably venous, the thorough systematic sponge-plugging may suffice, even in wounds of the internal jugular. **Contused and lacerated wounds** call for the same remarks, but it must be remembered that although the primary hemorrhage may not be copious, the secondary hemorrhages are most to be dreaded, and proper instruction in consequence must be given.

Gunshot wounds suggest the same remarks, with the aggravation of the presence of the ball in the deeper structures, in the pharynx, in the bones, or in the brain.

Poisoned wounds present nothing peculiar.

Peculiarities of the Injuries of the Lateral Region of the Neck (Region of the Sternomastoid or of the Carotid).

Burns or **frost-bites** present no peculiarity in the region of the sternomastoid, except when deep and reaching the sternomastoid or the underlying vessels and nerves.

Contusions or **blows** on the neck are always severe, but when striking the side of the neck over the jugular they are particularly severe, and are comparatively frequent. They may cause a hematoma in the sheath of the muscle; they may cause paralysis or contracture of the muscle, producing a variety of torticollis; the muscle is sometimes ruptured, also the vessels and the nerves, these have a train of symptoms which will be described further on.

Nonpenetrating wounds—*i. e.*, not extending deeper than the muscles and glands—are not serious unless through infection.

Penetrating punctured wounds of the neck may be deep without injuring the vessels and nerves, owing to the elasticity and mobility of the jugulocarotid vessels. Penetrating wounds of the external jugular, of the internal jugular, and the carotid arteries are more serious injuries. They all may give rise to circumscribed or diffused hematoma. When this is of some size and stationary, it must be aspirated or incised. When it pulsates and grows, it is because a traumatic aneurysm has formed, and the wounded vessel, vein, or artery must be ligated above and below the injured point. When the penetration is comparatively small, the sac may be incised at once, after making as good a pressure above and below as possible. When the puncture is large, and there is risk of the patient bleeding much before the proper ligatures are secured, a provisional loop ligature must be applied below the wounded point. When the wound or swelling is very low down, enough of the sternum must be resected to reach the root of the carotid and the innominate, and the provisional loop ligature applied there. Considering the gravity of a possible terrific hemorrhage, this advice is not too heroic. Never ligate the common or the internal carotid unless it is the wounded artery, because of the possible effects on the cerebral circulation. It is only when the persistent search for the wounded point of the vessel has not succeeded that the vessel itself should be ligated in continuity; below only, if possible. A ligature above, whenever applicable, should be applied to guard against recurrent distal hemorrhage. We must bear in mind that arteriovenous aneurysm often follows punctured wounds which have gone through the vein and the artery. Wounds of the vertebral artery in this part of the neck are more common in the canal of the transverse process. At the base of the neck wounds of the vertebral artery are more grave than those of the carotid.

The diagnosis of this wound will be made only when, upon cutting down through the extravasated blood, it is found that the carotid artery and the jugular vein are intact. When the hemorrhage is profuse, it should be stopped by plugging with the finger or by packing, and a loop ligature should be applied on the subclavian or the innominate before proceeding further; when the wound in the vertebral artery is located, it should be tied above and below; if necessary, the transverse process should be cut away with the bone-nippers. These remarks apply also to the wounds of the deep cervical, the inferior thyroid, the superior thyroid, the lingual, and the pharyngeal arteries.

Punctured penetrating wounds of the base of the neck are almost all fatal, on account of the impossibility of reaching the artery without fatal hemorrhage. Punctured wounds of the nerves of the region (recurrent, phrenic, pneumogastric, sympathetic, spinal accessory, cervical plexus) give rise to the symptoms of irritation of the nerves.

Nonpenetrating incised wounds are only serious if the external jugular vein has been injured, because air may then penetrate into the veins. When the edges of the wounds lose their parallelism, these may form a considerable hematoma. Incised wounds penetrating the sternomastoid and severing it incompletely are not so very serious.

Wounds dividing the sternomastoid muscle may result in curtailing power of the muscle from lengthening, due to the cicatrization. When the muscle has been completely severed and the head is still, it is sometimes brusquely thrown to the other side by the contraction of the intact sternomastoid. In case of division of the muscle from operation this does not take place, because the other muscles have gradually become accustomed, by the presence of the tumor, to keep the head properly balanced. The several ends must be strongly and closely stitched with strong catgut, and the head kept in proper position by a liquid-glass bandage.

Incised penetrating wounds of the internal jugular are perhaps more serious than the wounds of the carotid, because of the danger of penetration of air. When the respiration becomes embarrassed, the hemorrhage increases, just as in tracheotomy, where, as soon as the tube is introduced, the hemorrhage ceases. These wounds are often due to tearing during the removal of tumors. Whatever be the cause, if the vein alone is wounded, the blood is black and flows continuously. The first thing to do is to plug the opening, to prevent the penetration of air; next make pressure above and below with the fingers, enlarge the wound, and fill it with boiled water to prevent the possible penetration of air; then look for the wounded vein and ligate both ends. The proximal end is the most dangerous, because of the penetration of air and of the abundance of blood coming from the heart. When the compressing fingers are in the way or if their pressure is ineffectual, a provisional loop ligature should be placed around the internal jugular until the wounded ends are ligated. When the wound is low down, it may be necessary to resect the sternum and place a provisional ligature around the innominate vein or the superior cava. Incised wounds of the superior thyroid, lingual, and facial veins close to the internal jugular are almost as severe.

Incised penetrating wounds of the carotids give rise to profuse, even terrific, hemorrhage. When the wound is large, or when the hemorrhage is moderate but does not receive prompt attention, it may be immediately fatal. Death from hemorrhage from the carotid will thus ensue in 4 minutes, it is said. When the larynx or trachea is wounded, the blood penetrating into them causes death also from suffocation. The hemorrhage is sometimes stopped by fainting, if the wound is not too large. Upon reaching such a case, the first thing to be done is to plug the wound with the fingers or to pack it quickly. Packing will stop the hemorrhage temporarily if the vessel is of any size above 1/16 of an inch. It is best and safest to enlarge the wound and attempt to ligate the two ends in the wound; if this causes too much bleeding, a loop ligature must be applied as described. If the bleeding has stopped of itself, it must be borne in mind that it will almost surely return, and that it may do so when proper surgical assistance cannot be procured, and the patient may bleed to death; therefore, the case should be treated as described for punctured wounds. Incised penetrating wounds of the root of the neck are almost all fatal on the spot. The same remarks as above apply here. It is sometimes difficult to recognize which vessel of the neck has been divided; spurting, however, is characteristic of arterial lesion, but the vein may be divided at the same time. When the vein and artery are simultaneously wounded, ligate the ends of both. In all cases when clamping stops the bleeding and a ligature cannot well be substituted, the clamp should be left in place 36 to 48 hours.

Punctured wounds of the nerves of the region (recurrent, phrenic, pneumogastric, sympathetic, spinal accessory, cervical plexus) give rise to the symptoms of the irritation of those nerves. Incised wounds of the nerves of the region (recurrent, phrenic, pneumogastric, sympathetic, spinal accessory, cervical plexus) are followed by the following symptoms:

When the recurrent is wounded, there is aphasia, more or less complete. The section of the phrenic and pneumogastric on one side only is accompanied by respiratory and circulatory irregularities; they are not necessarily fatal, but it is a most serious complication. Park has shown that only about 50 percent of these cases are fatal. Complete wounds of the sympathetic are followed by atresia of the pupil, slight ptosis, congestion of the conjunctiva, headache, congestion of the side of the face (unless only stimulated). It produces mydriasis, pallor of face, and protrusion of eyeball. Injury of the superior laryngeal nerve is sometimes very serious. When possible, the divided ends must be sutured with fine silk.

Penetrating or **deep contused and lacerated wounds** of the region do not expose so much to primary hemorrhage, but the suturing of the muscles, the ligation of the vessels, and the stitching of the nerves cannot be relied upon as safe, because of the sloughing that usually follows those wounds; for the same reason secondary hemmorrhages are much more common and more grave. Penetrating or deep gunshot wounds of the region call for the same treatment, and, in addition, the frequent penetration of the digestive and respiratory tracts and spinal canal with their possible complications; the presence of a ball, or foreign bodies deeply lodged and unremovable in these wounds, injures the vessels more frequently and seriously than the deep punctured wounds. Here, less than anywhere else, should search be made for the bullet. When, however, the wound is larger, the finger may be introduced, and if the ball is felt, it should be removed.

Poisoned wounds, stings, bites, etc., present nothing peculiar in this region.

Foreign bodies, usually bullets, may remain embedded in the tissues without giving rise to any serious trouble; a bullet may thus remain in contact with the large vessels without causing disturbance, but not so with the nerves.

Rupture of the sternomastoid is more common than that of other muscles; it has taken place after falls, sudden twists, and violent muscular contractions. There are great pain, a depression on the course of the muscle, great hematoma; the head is often twisted by the action of the other muscle.

The treatment consists in placing the head in proper position, and immobilizing it in a liquid-glass bandage. The rupture is usually partial; when complete, the ends are far apart; it is well to cut down and stitch; otherwise a kind of torticollis may result from the lengthening of the muscle.

Peculiarities of the Injuries of the Supraclavicular Region.

Burns or **frost-bites** are rare, as the region is usually well protected.

Contusions sometimes present hematomata so large as painfully to compress the branches of the brachial plexus. In fractures of the clavicle the brachial plexus may be injured.

Superficial punctured wounds may open the external jugular, the terminal part of the external and anterior jugulars and of the cephalic, but they are seldom serious unless infected. Punctured wounds of the subclavian vein and artery may also give rise to serious hematomata. When persistent, they should be aspirated or incised. We should bear in mind that hematoma may be due to a wound of the vein, and that the connection may still exist. This will surely be the case if, after aspiration, it fills up again. In case of incision the deeper clots should not be disturbed, so as not to open the wound in the vein in case that lesion has occurred.

Injury to the subclavian artery is recognized by the pulsations of the hematoma; it is then a traumatic aneurysm. The artery should be ligated. When the swelling is moderate, the ligation should be made in the supraclavicular region, using, if necessary, an aneurysmal needle with a detachable point. In the majority of cases this simple ligation will suffice to cure the aneurysm; if not, compression of the axillary or its ligation should also be done, then the sac incised, and the injured points ligated above and below. When on the right side, the artery can only be reached and encircled in its second portion after dividing the anterior scalene; no permanent ligature should be applied there; a provisional loop ligature should be placed, the sac incised, and the injured point of the third portion ligated permanently above and below. On the left side the ligation of the second portion can be made permanent at once, as it is as safe on this side as a permanent ligature is unsafe on the second portion of the right side. When the swelling is so great as to cause failure of the procedure outlined, or so as to discourage even the attempt, but only then, a provisional ligature should be applied upon the first portion of the subclavian; the axillary should be compressed or treated in the same way; then the sac is incised and the two ends ligated. In some cases these ends cannot be found; packing with bits of aseptic sponges should then be resorted to, with compression over it. Should the hemorrhage return, the clavicle should be sawed through and the two ends secured. When the artery on the right side is wounded close to the scalene, so as to compel ligation of the second portion, this should be done with double catgut, without rupturing the coats, and with a bloodless space between the ligatures. On the left side the second portion can be ligated with safety after the old method, but the new method should be applied there also in preference. The permanent ligation of the first portion on either side should not be done unless it can be done thoroughly, with double catgut, without rupturing the coats, and with a bloodless space between. As this cannot be safely done, as a rule, without resecting the inner extremity of the clavicle and the corresponding part of the sternum, this should only be done when the ligation of the second portion cannot be performed satisfactorily as described. Arteriovenous aneurysm, due to punctured wounds of both the vein and artery simultaneously, should not be interfered with unless they grow or cause serious pressure-symptoms. Then both the artery and the veins should be ligated above and below, and the sac extirpated, unless too adherent to surrounding structures; if left in place, it should be incised, to diminish its pressure effects; sometimes these continue, although abated.

Punctured wounds of the nerves rarely cause paralysis, but may cause persistent pain, neuralgia, and trophic changes in the area of distribution. Punctured wounds of the lymphatic duct on the right, and of the thoracic duct on the left, may produce a chyloma, which should be treated as a venous hematoma; usually it is only then that it is recognized. Punctured wounds of the apex of the lungs may be followed by emphysema, at first limited and then generalized.

Superficial **incised wounds** are not serious unless infected. Bleeding from the external and anterior jugulars and of the cephalic is easily arrested; however, the wounding of these veins near their point of discharge into the subclavian may be followed by severe hemorrage and by entrance of air into the veins.

Incised wounds of the third portion of the subclavian artery, when large, are followed by rapid death; when smaller, they often cause traumatic aneurysms; the treatment is the same as indicated for punctured penetrating wounds. Incised wounds of the subclavian vein are most serious because of the amount of bleeding, often causing rapid death, and also because of the quick penetration of air into the vein. The vein should be at once plugged with the finger, or, better, an aseptic packing; then an attempt should be made to enlarge the wounds and to clamp it, then ligate the two ends. When this is impossible, a provisional loop ligature should be applied on the first portion of the vein; also compression should be made on the axilla and the two ends ligated. The ligation of the proximal end is to secure against hemorrhage and also against the entrance of air; but the ligation also of the distal end is, of course, indispensable.

Incised wounds of the lymphatic duct on the right side and of the thoracic duct on the left are diagnosed by the oozing of the peculiar fluid these ducts contain. If possible, the distal end should be ligated, and this usually stops the flow, since there is a valve on the proximal end. There is seldom, if ever, any discharge from it. When ligation is impossible, compression will often suffice. It is very seldom that any further trouble is noticed, because there exist usually two or three branches, and the uninjured ones carry on the circulation. When this fails and a chyle fistula is established, the patient loses flesh and succumbs.

Incised wounds of the brachial plexus are followed by paralysis of the affected area; they should be stitched at once. The lesions, from whatever cause, may affect only one branch. Paralysis never affects the interior, anterior, and posterior surfaces of the arm, because these are supplied by the anastomoses of the intercostal filaments with those of the internal brachial cutaneous. They must not be confounded with the anesthesia and paralysis resulting from contusions of the shoulder in hysteric subjects (hysterotraumatism). The treatment is by electricity. If a callus includes a nerve, it must be resected.

Incised wounds of the phrenic nerve are most serious. However, when the nerve has been pressed upon by a tumor for some time, the wounding of it is not so dangerous. Incised wounds of the apex of the lungs are not so likely to be followed by emphysema as the punctured wounds.

Contused and lacerated wounds are much more serious than clean wounds, because of the impossibility of primary union, and because of greater liability to secondary hemorrhage. Gunshot wounds also are serious, for similar reasons.

Dislocations of the head of the clavicle are a frequent cause of serious contusion of the region.

Fractures of the clavicle sometimes cause wounds of the vein or of the artery or of the brachial plexus. Shock accompanying injuries in this region is sometimes very great, on account of the large nerves implicated.

Peculiarities of the Injuries of the Posterior Region of the Neck.

Burns and **frost-bites** are only particularly important here because of the cicatrices which may follow, causing disfigurement in an exposed part, and also possibly causing deviations of the head, from retraction.

Contusions are more frequent than in front; they are particularly painful, because the muscles contused are those which keep the head in balance; they are often accompanied by fracture of the spinous processes and laminæ, contusion and concussion of the spinal cord and even of the brain.

Punctured wounds, nonpenetrating—*i. e.*, not penetrating the vertebral artery and the spinal cord—are simple wounds, and seldom give rise to any trouble. However, should they be large punctured wounds, and strike the deep cervical artery or the posterior jugular veins, they may give rise to serious hematoma. When this persists, it should be aspirated or incised. When it pulsates, it is a traumatic aneurysm of the said artery, and should be treated as such. Punctured wounds of the vertebral artery may give rise to an aneurysm also, which must be treated as such—that is, by ligating above or below, or both, when possible, and then incised. Much hemorrhage must be expected from the untied end, and the surgeon must plug tightly with aspectic sponge and make firm pressure with a bandage.

Punctured wounds of the spinal canal through the interlaminar spaces, when the head is flexed forcibly, or through a fracture of the laminæ, are serious only if becoming infected. Incised wounds reaching the spinal cord itself are followed by paralysis of the parts below. If the wound is and remains uninfected, the cicatrization by primary union may take place and the paralysis disappear; if not, it will be permanent. If between the occipital and the atlas or axis the medulla oblongata is severed, death is instantaneous. Infanticide is often effected by a long needle or pin driven between the occiput and the vertebra. If the lesion is above the origin of the phrenic, death follows quickly by paralysis of the diaphragm. Incised wounds of muscles are usually due to sabre cuts; they may include almost all the muscles; they may reach the vertebræ, when the head drops forward; the hemorrhage is great. Incised wound of the vertebral artery give rise to profuse hemorrhage. The peculiarities of the treatment of these wounds are the need of prompt attention, the impossibility of ligating both ends of the artery if it has been wounded high up, the suturing of the large muscles, the difficulty of keeping the head steady, and to secure drainage. A liquid-glass bandage or a jury-mast apparatus will assist materially.

Wounds of the posterior region are said to be followed by sexual impotency when the membranes of the cord are involved; also by paresis and wasting of the lower extremities and of the testicles. Larrey contends that these results may take place even when the cord is not affected.

Gunshot wounds are usually serious if they reach the membranes or the cord. When pressure-symptoms are present, very extensive and deliberate dissections must be done to remove the ball, the fragments of broken lamellæ, or clots or foreign bodies which cause the pressure. Foreign bodies causing pressure-symptoms on the cord must be removed at almost any cost.

Ruptures of the muscles of the nucha are reported in those who carry heavy loads on the head; the symptoms are those of other muscular ruptures. Ruptures of the attachments of the rhomboid and of the levator anguli scapulæ have been seen in farm-laborers. Shock accompanying injuries of the posterior region is usually great, being often complicated by concussion and contusion of the cord or of the cerebellum or of the whole brain.

NECROSIS.—The death of cells surrounded by living tissues. Necrosis proper refers to death in mass; necrobiosis, to death of individual cells. Among the causes of necrosis are (1) direct injury; (2) obstruction of the circulation; (3) loss of trophic influence. The varieties of necrosis are: (1) Coagulative necrosis; (2) liquefactive necrosis; (3) cheesy necrosis; (4) dry and moist gangrene. See GANGRENE. Necrosed tissues may be absorbed, retained, or thrown off. The dead tissue is called *sequestrum* in case of bone and *sphacelus* in case of soft parts. In surgery the term necrosis is often applied specifically to the death of bone. See BONE (Diseases).

NELAVAN.—See SLEEPING SICKNESS.

NEPHRECTOMY.—See KIDNEY (Surgery).

NEPHRITIS (Bright's Disease; Inflammation of the Kidney).—Marvelously accurate as were Bright's descriptions of many of the forms of renal disease which have since received his name, it is clearly unreasonable to limit the name to the conditions literally described by him, since others, evidently a part of the same process, were not included in his descriptions, while other additions, in turn, had to be made to fill out these. Naturally, too, all are not agreed, even to-day, as to what should be included under the term. On the other hand, it would be futile to attempt to eliminate the words "Bright's disease" from the nosology. Under the term will be considered: (1) *Acute parenchymatous* or *acute diffuse nephritis*; (2) *chronic parenchymatous* or *chronic diffuse nephritis*, with a second or indurated stage of the latter; and (3) *chronic interstitial nephritis*. The *amyloid* or waxy kidney is not, strictly speaking, a variety of Bright's disease. Amyloid disease of the kidney occurs in two forms—first, as a part of general amyloid disease, shared by the kidney in common with the liver, spleen, and other organs; and, second, as amyloid infiltration of certain portions of kidney previously invaded by inflammation. See URINE (Examination).

Acute Parenchymatous Nephritis.

The peculiarity of this form of Bright's disease is that, in the majority of cases, the cells lining the uriniferous tubules are the primary seat of attack. As such, the cells enlarge, proliferate, and degenerate, choking up the tubules and interfering with the proper elimination of excrementitious matters usually separated from the blood by the kidneys.

Etiology.—Most cases of acute parenchymatous nephritis are caused by the infectious diseases, especially scarlet fever and diphtheria, though cold, and especially cold combined with moisture, is an acknowledged cause.

Symptoms.—The first symptom to attract attention is generally a puffiness about the face (see FACE IN DIAGNOSIS), which usually extends to the extremities and, in extreme cases, to the trunk, producing in a word, general anasarca. Thus, attention is attracted to the urine, which often appears "smoky" to the naked eye, an appearance due to the presence of small quantities of blood in acid urine. The same urine, if made alkaline, will exhibit a brighter red hue. It contains albumin, commonly in large amount, and the microscope shows numerous blood discs, also blood casts, epithelial casts, and free renal epithelium. This may be regarded as the distinctive sediment of acute nephritis. Hyaline casts, which are not characteristic of any form of renal disease, are also present. To these are soon added, in all cases of prolonged duration, dark granular casts and dark granular cells representing degenerated renal cells. Pus-cells and pus-casts are sometimes present.

The urine of acute Bright's disease is also scanty, of correspondingly high specific gravity, and disposed to deposit uric acid crystals and mixed urates when in the fresh state. At the beginning the specific gravity of the urine is high. Complete suppression of urine is not infrequent. Various degrees of inconvenience result from the dropsy. It may involve the penis and scrotum, invade the serous cavities, especially the pleuræ and peritoneum. Positive fever is seldom present; neither is severe pain in the kidney region, although it is more frequent in this than in any other form of Bright's disease. The pulse is moderately accelerated. Nausea and vomiting sometimes usher in the disease.

The serious danger of acute Bright's disease is uremia, a toxic condition due to retention of excrementitious substances, of which urea is the type. Uremia possesses its own symptomatology. Headache and drowsiness may be initial symptoms. At other times sudden vomiting is the first sign. Not infrequently epileptoid convulsions, without previous warning, are the earliest manifestations; at all times an alarming and dangerous symptom. The convulsions usually alternate with periods of drowsiness, though sometimes also with lucid intervals. The onset of convulsions is sometimes preceded by sudden blindness and amaurosis. Sometimes the pulse is abnormally slow. If the condition does not pass away, exhaustion supervenes, and Cheyne-Stokes breathing may be the final symptom. Rarer symptoms of acute nephritis are an intense itching of the skin; shortness of breath, due to edema of the lungs or a feeble dilated heart; delusional insanity as a part of the uremic symptomatology; and palsies, monoplegic or hemiplegic.

Complications and sequels of acute nephritis are not numerous. They include pleurisy, pneumonia, bronchitis, and pulmonary edema. Hypertrophy of the left ventricle is a possible, but very rare, result.

Diagnosis.—The diagnosis is easy. Dropsy, beginning in the face, albuminuria, blood discs, blood casts, and epthelial casts in the urine point unmistakably to acute Bright's disease.

ACUTE PARENCHYMATOUS NEPHRITIS.	CHRONIC PARENCHYMATOUS NEPHRITIS.	CHRONIC INTERSTITIAL NEPHRITIS.
1. Most common in children, from exposure or infectious fevers.	1. Later life; often the consequence of acute attack.	1. Later life; often results from alcoholism, gout, lead-poisoning.
2. Edema of lower eyelids; then of upper extremities, trunk, and, lastly, lower extremities.	2. In early stage same as acute form; later, dropsy may diminish.	2. Dropsy slight or entirely absent.
3. Urine scanty, dark or smoky color, high specific gravity, 1025 or over.	3. Urine normal or increased amount; specific gravity may fall to 1010; urine pale.	3. Urine greatly increased; specific gravity low, 1005; urine pale in color.
4. Large amount of albumin.	4. Late in attack, greatly diminished; occasionally absent.	4. Albumin greatly diminished, often absent.
5. Variety of casts, such as hyaline, blood, epithelial, and waxy casts, also free red blood globules, and epithelial cells.	5. Large and small granular casts; compound granule cells, and fatty epithelium.	5. Hyaline or finely granular casts, occasionally dark in color; infrequently blood casts and oil droplets.
6. Urea diminished.	6. Urea diminished.	6. Urea diminished.
7. Recoveries frequent.	7. Recoveries rare..	7. Indefinite duration, but never cured.

Prognosis.—This is usually favorable if treatment is promptly instituted. Sometimes the disease is overlooked for a time, when it is more intractable. In fatal cases uremic convulsions often end the scene.

Treatment.—Many cases recover without other treatment than rest in bed, warmth, and milk diet. These are all essential to a successful treatment. In severe cases dry cups, followed by fomentations, should be applied to the loins. In all cases brisk purgation should be produced, especially by the salines, including bitartrate of potassium and compound jalap powder. Calomel and jalap are good preliminary purges. Action of the skin should be favored by sweet spirit of niter, neutral mixture, warm applications and warm baths, and, if necessary, by the vapor bath.

Having secured a free action of the bowels, digitalis, 5 to 20 minims of the tincture every 4 hours, is the best diuretic, but it may be substituted by the tincture of strophanthus in the same dose, or by spartein in 1/4 to 1/2 of a grain doses every 4 hours. When spartein cannot be obtained, broom tea may be used. It is an efficient but nauseous diuretic. Infusion of cream of tartar and juniper berries is at once a good diuretic and aperient, or the cream of tartar may be used alone, making a drink which is pleasant when cool.

Should uremic convulsions supervene, the most prompt and energetic measures must be used. Immediate elimination should be secured by active purgation by croton oil or elaterium, vapor baths, and, if necessary, pilocarpin should be employed to promote sweating. Pilocarpin hydrochlorid should be given hypodermically in doses of 1/12 to 1/3 grain, according to the age of the patient. Its action should be favored by warm covering and hot applications. The convulsions should be controlled by chlorform or chloral.

Chronic Parenchymatous Nephritis.

In this form of chronic Bright's disease, beside the tubal involvement, the interstitial tissue becomes infiltrated with cells, which are later differentiated into fibroid tissue, resulting in more or less induration. The tubular involvement is still a conspicuous part of the process. The tubules are distended by proliferated and degenerated cells, which include fatty cells as well as cells less advanced in degeneration. Certain white specks are resolvable by the microscope into coils of fattily degenerated tubules. Its typical macroscopic product is the large white kidney. An indurated form sometimes results, which is regarded by some as a further stage of the large white kidney—stage of secondary contraction—but probably also occurs as a direct result of the diffuse nephritis.

It may be a continuation of the acute form, or it may originate *de novo*, or it may arise insidiously, more frequently, perhaps, favored by a vulnerability due to a previous acute parenchymatous nephritis.

The symptoms include edema in various degrees, which in an advanced stage of the disease equals that described in acute nephritis. Less advanced stages exhibit slighter degrees of dropsy, while in some cases there is no edema. In many cases there is no dropsy in the initial stage.

The urine is albuminous, and the quantity of albumin is variously large. The sediment includes hyaline casts, oil casts, dark granular casts, and casts containing fatty renal cells. In addition are found free fatty renal cells, granular fatty cells (compound granule cells). More rarely blood-corpuscles are present, and in a few instances there is more or less constantly present blood—constituting chronic hemorrhagic nephritis. See URINE (Examination).

There are few other distinctive symptoms. Edema is not always present. A peculiar waxy appearance of the skin often betrays the disease, with a yellowish tinge, as contrasted with the opaque white of the edema of acute Bright's disease. Cardiac symptoms are more frequent than in the actue form. Hence weakness and shortness of breath are often symptoms. The same complications are liable to occur as in the acute form. There are no symptoms by which the onset of the stage of secondary contraction may certainly be recognized. Long duration of the illness is presumptive evidence that contraction has set in, and when there is superadded hypertrophy of the left ventricle and accentuation of the aortic second sound, with polyuria and lowered specific gravity of the urine, its occurrence is rendered more likely.

The diagnosis is usually easy. High albuminuria, with dropsy and fatty casts, free fatty renal cells, and granular fatty cells point easily to chronic parenchymatous nephritis. There are, however, intermediate forms, when the albumin is less copious and the distinctive forms of casts are wanting, when the distinction between chronic parenchymatous nephritis and chronic interstitial nephritis only becomes possible by prolonged study of the case.

Amyloid degeneration often invades chronic nephritis, but no additions are made to the symptoms by which such a state of affairs can be recognized. In the purer forms of amyloid disease the kidney shares the process with the spleen and liver, and enlargement of these, associated with the causes of such degeneration, come to our aid in diagnosis.

The prognosis is unfavorable as to cure, but if the cases are brought under proper management as to diet, habits of life, and some treatment by medicine, much can be done to prolong life.

The treatment is, however, more difficult than in acute nephritis. More discrimination is required and results are more difficult of attainment. Spontaneous recovery is probably impossible.

The indications are, first, to improve nutrition, restrain the accumulation of toxic matters in the blood, and second, to combat symptoms and complications. The first indication is fulfilled by suitable food and tonics, including iron. The food should be easily assimilable, in which proteids are kept at a minimum. Milk and vegetables are the ideal diet, yet a moderate amount of meat, fish, and eggs may be permitted under ordinary circumstances. It is rather the quantity than the kind which must be limited. Red meats are sometimes disallowed, and a quantity of fish and poultry permitted which far outweighs in its nitrogen a small piece of beefsteak. Rich milk should be avoided and should be diluted by water or Vichy. As such it should always constitute a large part of food. Rice, properly cooked, is a typical article of food for this form of disease.

Milk may be taken boiled or unboiled, hot or cold, according to the convenience and taste of the patient. Raw milk is generally better digested than boiled milk. It should be taken regularly every 3 hours, in the proportion of 6 to 10 ounces or more, according as the total quantity in 24 hours is to be 2 or 3 liters.

The dose of milk should be taken slowly, in small swallows, so that the clots formed in the stomach may be as small as possible. For cow's milk, which is generally employed, we may, as required in individual cases, substitute, in whole or in part, the milk of the goat or the ass, also kefir or koumiss. If the taste of milk is very repugnant to the patient, it may be flavored with orange-water or some other agreeable flavor. It is unnecessary to employ for this purpose brandy or other alcoholic liquors. All the efforts of the physician should be directed to making the patient and his friends understand that milk is the essential basis of the treatment.

Iron, quinin, and strychnin are excellent tonics, yet iron is too often indiscriminately given, and sometimes more harm is done with it than good by locking up secretions, causing headache and constipation. Large doses should be avoided. A few drops of the tincture of the chlorid of iron and a dram or two of Basham's mixture should suffice for a dose. Rest, bathing, and massage are advisable hygienic measures. The clothing should always include wool next the skin in winter and summer. Elimination by the skin is facilitated by such clothing. The urine should be tested by frequent analysis, and if the quantity of urea eliminated is small compared with that ingested, its excretion should be stimulated by warm baths, warm packs, or vapor baths. The urine elimination should be aided by aperient remedies, including salines. Edema is to be treated by the same measures as acute nephritis. Sometimes it is very helpful to scarify the legs. Enormous quantities of fluid are thus liberated, with great relief to the patient. Uremia should be treated as described under acute nephritis.

Chronic Interstitial Nephritis (Contracted Kidney).

In this form of Bright's disease the resultant is a small kidney in which the interstitial connective tissue predominates, but whether this is the result of a primary overgrowth of connective tissue at the expense of the tubular structure, or whether the latter slowly disintegrates to be as gradually replaced by fibroid tissue, is a question more unsettled of late than it formerly was.

The cause often cannot be traced. Overfeeding, gout, lead, alcohol, and syphilis cause a certain number of cases. Grief and anxiety have been assigned to rather an undue portion of responsibility by some authors. Hereditary influence must be admitted. Arteriosclerosis is a cause and a consequence.

Symptoms.—The characteristic of its symptomatology is insidiousness of onset. Often the disease is discovered accidentally in a routine examination of urine, or by the ophthalmologist in the eye clinic, when least suspected by the patient—an examination suggested by a dimness of vision or more or less blindness. As often the discovery of hypertrophy of the left ventricle without explainable cause leads to an examination of the urine, and the discovery of a small amount of albumin and a few casts. More rarely a sudden outburst of uremic convulsions is the first intimation of the presence of the disease, and may also be the concluding symptom. Headache is a frequent symptom, with unpleasant throbbing in the temples. Occipital headache is said to be especially characteristic, but this symptom occurs under so many conditions that it can scarcely be allowed any diagnostic value. Never, except sometimes toward the close of the disease, is there dropsy in a marked degree, though at times a tightness of the shoe or a swelling about the ankle toward evening first attracts the attention of the patient.

The changes in the urine are more or less characteristic. The quantity is always copious; its specific gravity is low, and in it are found usually only a few hyaline casts, occasionally containing an oil drop or two. Casts are often not found, though less frequently with the use of the centrifuge. Albumin is sometimes totally absent, and there is a prealbuminuric stage, rarely recognized, in which there is neither albumin nor casts. See URINE (Examination).

Arterial sclerosis, recognizable commonly only in the radials, sometimes in the temporals, is more or less characteristic. Its exact relation to the renal disease is perhaps not precisely determined. Sometimes found early, and even preceding other symptoms, it may then be regarded as a cause. At others, occurring later, it is perhaps a consequence. The changes are chiefly in the intima and media, inflammatory and degenerative rather than hypertrophic in the muscular coat, as once supposed.

The diagnosis is commonly easy. The absence of dropsy, small amount of albumin, few hyaline casts, hypertrophy of the left ventricle, and albuminuric retinitis point rarely to anything else except the contracted kidney. Only in those cases of chronic parenchymatous nephritis referred to in the stage of secondary contraction or in the undeterminate and imperfectly developed first stage is there sometimes difficulty, which time and a careful study will remove.

The prognosis of contracted kidney is unfavorable as to recovery. No kidney in which the characteristic interstitial change has been wrought probably ever returns to its normal state. Something may be done to arrest further development of the disease, so far as it is possible to counteract the causes which favor its spread. Sooner or later the disease advances slowly or rapidly to an ultimate unfavorable termination.

Treatment.—As has been intimated, treatment must consist mainly in measures calculated to arrest the spread of the disease from localized foci in the kidney to larger areas. The uric acid of the gouty diathesis must be kept in solution or eliminated, lead must be dissolved out of the blood, alcohol and excessive eating, especially of proteid foods, must be cut down, and the patient put upon a diet of milk, vegetables, and fruits. High arterial pressure should be reduced by full doses of nitroglycerin and aconite. If uremia threatens, milk and Vichy or milk and water should be given in lieu of all other nourishment for a time. The bowels should at all times be kept free, and medicines calculated to lock up secretions, such as iron and other astringents, should be avoided. The occasional use of mercurial aperients is helpful, and the free ingestion of liquids between meals should be encouraged. Diuretics are not indicated in the earlier stages so long as the secretion is free. The same hygienic measures described as necessary in chronic parenchymatous nephritis are essential in this form of disease. The treatment of uremia is identical with that described under acute and chronic parenchymatous nephritis.

Drugs are not likely to be serviceable in clearing away the interstitial overgrowth. Theoretically, iodin and mercury should do this, but biniodid and bichlorid of mercury in suitable doses have been given for months without result. The gold preparations are not recommended. There are, however, men of experience who claim to have had good results from all of these remedies, and there is no reason why their use should not be continued until their true value is determined. The use of opium in interstitial nephritis, especially for the control of uremic convulsions, is dangerous, and likely to prolong the condition it is purposed to relieve.

Amyloid Disease.

There are two ways in which amyloid disease may invade the kidneys: first, as a complication of chronic diffuse nephritis; and, second, as a part of general amyloid disease when the kidneys share the process with the spleen, liver and other organs of the body. The first is not recognizable by any means at our disposal; the second may be inferred from the presence of the causes of amyloid disease: viz., syphilis, suppuration, and exhausting drains on the system, along with enlargement of the liver and spleen, albuminuria, and casts. The so-called waxy cast is probably more frequent in this form of chronic disease, but is not peculiar to it, or even to chronic disease at all, as it is found also in acute nephritis. In addition to these, the other varieties of casts more or less characteristic of chronic nephritis are also found: viz., oil casts, dark granular casts, and fatty renal cells. The albuminuria is not commonly so large as in the typical forms of chronic parenchymatous nephritis.

The treatment of the first of these forms is that of chronic parenchymatous nephritis; of the second, that of the condition causing the amyloid disease, aided by the tonic and restorative measures needed in the treatment of chronic parenchymatous nephritis.

NEPHRITIS OF PREGNANCY.—Kidney insufficiency occurs in about 6 percent of all pregnant women, and is the result of the kidney of pregnancy, or true nephritis.

The kidney of pregnancy is a peculiar noninflammatory condition in which the kidney becomes anemic and the epithelial cells become infiltrated with fat.

The cause is probably some condition which interferes with the blood supply to the kidney, such as compression of the kidney by the gravid uterus, spasmodic contraction of the renal arteries, and an exaggerated hydremia of pregnancy.

The symptoms usually manifest themselves during the latter months of pregnancy. These are albuminuria, more or less pronounced, and probably some hyaline and granular casts. Desquamated epithelial cells filled with fat may also be found. The condition becomes more marked as pregnancy advances, and it not infrequently terminates in an outbreak of eclampsia. It disappears spontaneously after labor.

Nephritis may manifest itself as an acute or chronic condition, the latter being the more common.

The symptoms are the same as in uncomplicated Bright's disease.

The differential diagnosis between chronic nephritis and the kidney of pregnancy may be determined by the following:

Chronic Nephritis.	Nephritis of Pregnancy.
1. There may be a history of previous kidney disturbance.	1. There is no such history.
2. There may be albuminuric retinitis.	2. There is no albuminuric retinitis.
3. Symptoms appear in the first half of pregnancy.	3. Symptoms appear in the latter half of pregnancy.
4. Casts are usually present in large number—hyaline, granular, waxy, and fatty.	4. Hyaline and granular casts may appear, but are usually few in number.
5. Symptoms persist after delivery.	5. Symptoms disappear after delivery.

The prognosis is grave; eclampsia may occur at any time.

The treatment of kidney insufficiency during pregnancy should be prophylactic and curative. Every pregnant woman's urine should be regularly examined: during the first 6 months, once every 3 weeks; later, once every week or 10 days. Should albumin appear, daily quantitative examinations should be made. This is most conveniently done by the use of an Esbach's albuminometer. If the amount of albumin is slight, if there are no casts, and if there are no general symptoms, such as edema; dietetic and hygienic treatment is sufficient.

The patient should avoid exposure to cold and wet; the skin should be kept active by frequent bathing, followed by brisk rubbing; the bowels should be moved at least once daily; and the diet should be light and easily digested. No meat should be allowed. Milk, milk-broths, and the lighter vegetables are appropriate. Should the albumin increase in amount; should casts appear in abundance; and should there be edema of the face or extremities, thorough and active treatment is indicated. The patient should be confined to bed; the diet should be exclusively milk; the bowels should be moved 2 to 4 times daily by the use of salines; and diaphoresis should be encouraged by the use of hot baths. Diuretics are indicated, such as digitalis, caffein, strophanthus, and Basham's mixture. If, in spite of this treatment, the symptoms become progressively worse, the induction of abortion or premature labor is indicated. This is particularly urged if there are serious eye symptoms, or if there is persistent headache, since they are the premonitory symptoms of eclampsia. See ECLAMPSIA.

NEPHRECTOMY.—See KIDNEY (Surgery).

NEPHROLITHIASIS.—See KIDNEY (Stone).

NEPHROLITHOTOMY.—See KIDNEY (Surgery).

NEPHRORRHAPHY.—See KIDNEY (Surgery).

NEPHROTOMY.—See KIDNEY (Surgery).

NERVES, TABLE OF PRINCIPAL.

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Abducens (sixth cranial).	Motion	Fourth ventricle	External rectus of eye	Filaments.
Alveolar	Sensation	Inferior dental	Molar and bicuspid teeth, and adjacent gums.	Gingivales.
Articular	Trophic, sensory (?)	Anterior crural	Knee-joint	Capsular, synovial.
Articular, 2	Trophic, sensory (?)	Ulnar	Elbow-joint	Filaments.
Articular, recurrent	Motion	External popliteal	Knee-joint and anterior tibial muscle.	Filaments.
Auditory (eighth cranial).	Hearing	Restiform body	Internal ear	Vestibular, cochlear.
Auricular (*posterior*)	Motion	Facial	Retrahens aurem, attollens aurem, occipitofrontalis.	Auricular, occipital.
Auricularis magnus	Sensation	Cervical plexus, 2d and 3d cervical.	Parotid gland, face, ear	Facial, mastoid and auricular.
Auriculotemporal	Sensation	Inferior maxillary	Pinna and temple	Articular, two branches to meatus, parotid, anterior auricular, superficial temporal.
Buccal	Motion	Facial	Buccinator and orbicularis oris muscles.	Filaments.
Buccal, long	Sensation, motion (?)	Inferior maxillary	Cheek	Superior and inferior buccinator and external pterygoid.
Calcanean, internal	Sensation	Posterior tibial	Fascia and integument of heel and sole.	Several small filaments.
Cardiac (cervical and thoracic).	Inhibition	Vagus	Heart	Branches to cardiac plexuses.
Cavernous	Sensation	Prostatic plexus	Erectile structures of penis.	Filaments.
Cervical, eight	Motion and sensation	Cord	Trunk and upper extremities.	Ventral and dorsal divisions. See *Plexus*.
Cervical, 1st (anterior division).	Motion and sensation	Cord	Rectus lateralis and two anterior recti.	Filaments and communicating to vagus, hypoglossal, sympathetic.
Cervical, 1st (posterior division).	Motion and sensation	Cord	Recti, obliqui, complexus.	Communicating and cutaneous filaments.
Cervical, 2d (anterior division).	Motion and sensation	Cord	Communicating	Ascending, descending, communicating and filaments.
Cervical, 2d (posterior division).	Motion and sensation	Cord	Obliquus inferior, scalp, ear, complexus, splenius, trachelomastoid.	Internal or occipitalis major, and external.
Cervical, 3d (anterior division).	Motion and sensation	Cord	Communicating	Ascending, descending, and communicating filaments

NERVES, TABLE OF PRINCIPAL.

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Cervical, 3d (posterior division).	Motion and sensation	Cord	Occiput, splenius, complexus.	Internal, external, and filaments.
Cervical, 4th (anterior division).	Motion and sensation	Cord	Shoulder and communicating.	Communicating filaments, muscular, etc.
Cervicals, 5th to 8th (anterior divisions).	Motion and sensation	Cord	Brachial plexus	Communicating.
Cervicals, 4th to 8th (posterior divisions)	Motion and sensation	Cord	Muscles and skin of neck	Internal and external branches.
Cervicofacial	Motion	Facial	Lower part of face and part of neck.	Buccal, supramaxillary, inframaxillary.
Chorda tympani	Motion	Facial	Tongue, tympanum, submaxillary gland.	Filaments.
Ciliary	Sensation, nutrition, motion.	Ciliary ganglion	Eyeball	Filaments.
Circumflex	Motion and sensation	Brachial plexus	Teres minor, deltoid and skin.	Anterior, posterior and articular.
Coccygeal	Motion	Coccygeal plexus	Coccygeus and gluteus maximus.	Filaments.
Colli, superficialis	Sensation	Cervical plexus	Platysma myoides and ventrolateral parts of neck.	Ascending and descending branches, filaments
Communicans hypoglossi.	See *Communicans noni.*			
Communicans noni	Motion and sensation	Second cervical, third cervical.	Descendens noni, depressor muscles of hyoid bone.	Omohyoid and filament, ansa hypoglossi.
Communicating	Motion and sensation	Cervical plexus	Spinal accessory	Branches.
Communicating	Sensation and motion	First and second cervical.	Vagus, hypoglossal, sympathetic.	Three branches and filaments.
Crural	Sensation	Genitocrural	Skin, upper and central part ant. aspect of thigh.	Filaments.
Crural, anterior	Motion and sensation	Lumbar plexus, second, third and fourth lumbar nerves.	Thigh	Middle and internal cutaneous, long saphenous, muscular, articular.
Cutaneous	Sensation	Musculospiral	Skin of arm, radial side of forearm.	One internal, two external.
Cutaneous	Sensation	Ulnar	Wrist and palm	1st and palmar cutaneous.
Cutaneous (dorsal)	Sensation	Ulnar	Little and ring fingers	Filaments and communicating branches.
Cutaneous (external)	Sensation	2d and 3d lumbar	Skin of thigh	Anterior, posterior.
Cutaneous (internal)	Sensation	Brachial plexus	Forearm	Anterior and posterior branches and filaments.
Cutaneous (lesser internal) (*of Wrisberg*)	Sensation	Brachial plexus	Inner side of arm	Filaments.
Cutaneous (middle and internal).	Sensation. Motion (?)	Anterior crural	Thigh and communicating.	Communicating and filaments.
Cutaneous, perforating.	Sensation	Fourth sacral	Integument covering gluteus maximus.	Filaments.
Dental (inferior or mandibular).	Sensation	Inferior maxillary	Teeth, muscles	Mylohyoid, incisor, mental, dental.
Dental, superior	See *Dentale* (*posterior* and *anterior*).			

NERVES, TABLE OF PRINCIPAL.

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Dentals (post. and ant.).	Sensation	Superior maxillary	Teeth	Filaments.
Descendens hypoglossi.	Motor	Cervical plexus	Omohyoid, sternohyoid, sternothyroid, thyrohyoid, geniohyoid, hyoglossus and muscles of tongue.	Muscular, tongue.
Descendens noni	See *Descendens hypoglossi.*			
Digastric	Motion	Facial	Posterior belly of digastric.	Filaments.
Dorsal, 12 (anterior and posterior divisions).	Motion and sensation	Cord	Muscles and skin of chest and trunk.	External, internal, cutaneous.
Dorsal (of clitoris)	Homologue of dorsal of penis.			Filaments.
Dorsal (of penis)	Sensation	Pudic	Penis	Filaments.
Facial (seventh cranial, portio dura).	Motion	Floor of fourth ventricle.	Face, ear, palate, tongue.	Petrosals, tympanic, chorda tympani, communicating, post. auricular, digastric, stylohyoid, lingual, temporal, malar, infraorbital, buccal, superior and inferior maxillary.
Frontal	Sensation	Ophthalmic	Forehead and eyelids.	Supraorbital, supratrochlear.
Genital	Motion and sensation	Genitocrural	Cremaster muscle	Filaments.
Genitocrural	Motion and sensation	First and second lumbar.	Cremaster and thigh	Genital, crural, communicating.
Glossopharyngeal (ninth cranial).	Sensation and taste	Fourth ventricle	Tongue, middle ear, tonsils, pharynx, meninges.	Tympanic, carotid, pharyngeal, muscular, tonsillar, lingual.
Gluteal (inferior)	Motion	Sacral plexus (2d and 3d sacral nerves).	Gluteus maximus	Filaments.
Gluteal (superior)	Motion	Sacral plexus	Glutei, tensor vaginæ fem.	Filaments.
Gustatory	See *Lingual.*			
Hemorrhoidal (inferior).	Sensation and motion	Pudic	External sphincter ani, and adjacent integument.	Filaments.
Hypogastric	Sensation	Iliohypogastric.	Skin about external abdominal ring.	Filaments.
Hypoglossal (twelfth cranial).	Motion	Floor of fourth ventricle.	Hyoglossus and hyoid muscles.	Descendens noni or hypoglossi, muscular, thyrohyoid, geniohyoid and meningeal.
Iliac	Sensation	Iliohypogastric	Integument covering fore part of gluteal region.	Filaments.
Iliac	Sensation	Last dorsal	Integument covering fore part of gluteal region.	Filaments.
Iliohypogastric	Motion and sensation	First lumbar	Abdominal and gluteal regions.	Iliac, hypogastric, communicating.
Ilioinguinal	Motion and sensation	First lumbar	Inguinal region and scrotum.	Muscular, cutaneous and communicating.
Inframaxillary	Motion	Facial	Platysma myoides	Filaments.
Infraorbital	Sensation and motion	Facial	Nose and lip	Palpebral, nasal, labial.

NERVES, TABLE OF PRINCIPAL.

Name.	Function.	Origin.	Distribution.	Branches.
Infratrochlear	Sensation	Nasal	Skin and conjunctiva of inner part of eye, lacrimal sac.	Filaments.
Intercostal	Motion and sensation	Spinal cord	Muscles and integument of thorax.	Muscular, anterior and lateral cutaneous.
Intercostohumeral	Sensation	Second intercostal	Integument of upper two-thirds of inner and posterior part of arm.	Filaments.
Interosseous (anterior).	Motion	Median	Deep muscles of forearm.	Filaments.
Interosseous (posterior).	Motion and sensation	Musculospiral	Carpus and radial and posterior brachial regions.	Filaments.
Labial	Motion and sensation	Superior maxillary	Muscles and mucous membrane of lips.	Filaments.
Lacrimal	Sensation	Ophthalmic	Gland and conjunctiva	Filaments.
Laryngeal (recurrent or inferior).	Motion	Vagus	Larynx	Branches to all laryngeal mus. except cricothyroid.
Laryngeal (superior)	Sensation and motion	Vagus	Larynx	External—cricothyroid muscle and thyroid gland. Internal—mucous membrane of larynx.
Lingual	Motion and sensation	Facial	Mucous membrane of tongue, palatoglossus and styloglossus muscles.	Filaments.
Lingual	Sensation	Glossopharyngeal	Circumvallate papillæ and glands of tongue.	Filaments.
Lingual	Taste and sensation	Inferior maxillary	Tongue and mouth	Filaments.
Lumbar (5)	Motion and sensation	Cord	Lumbar and genital tissues.	Anterior and posterior divisions, lumbar plexus.
Malar	Motion	Facial	Lower part of orbicularis palpebrarum, and eyelids.	Filaments.
Malar	Sensation	Orbital	Skin over malar bone	Filaments.
Mandibular	See *Maxillary, inferior.*			
Masseteric	Motor	Inferior maxillary	Masseter muscle (and temporal?).	Filaments.
Maxillary (inferior)	Sensation, motion, and taste.	Trigeminus	Muscles of mastication, ear, cheek, tongue, teeth.	Masseteric, auriculotemporal, buccal, gustatory, inferior dental.
Maxillary (superior).	Sensation	Trigeminus	Cheek, face, teeth	Orbital, sphenopalatine, dentals, infraorbital.
Median	Motion and sensation	Brachial plexus	Pronator radii teres, flexors, two lumbricales, fingers, palms.	Muscular, anterior interosseous, palmar cutanéous.
Meningeal	Sensation	Glossopharyngeal	Pia and arachnoid	Filaments.
Meningeal	Sensation	Hypoglossal	Dura mater	Filaments.
Meningeal	Sensation	Vagus	Dura around lateral sinus.	Filaments.
Meningeal, recurrent.	Sensation	Inferior maxillary	Dura and mastoid cells	Filaments.
Mental	Motion and sensation	Inferior maxillary	Mucous membrane of lower lip and chin.	Filaments.

NERVES, TABLE OF PRINCIPAL.

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Motor oculi (third cranial).	Motion................	Floor of aqueduct of Sylvius.	All muscles of the eye, except external rectus, superior oblique, and orbicularis palpebrarum.	Filaments.
Muscular...........	Motion and Sensation..	First and second cervical.	Rec. cap. lat., rec., anterior major et minor.	Filaments.
Muscular...........	Motion and sensation...	Cervical plexus......	Sternomastoid, lev. ang. scap., scal. med., trapez.	Filaments.
Muscular...........	Motion................	Brachial plexus......	Longus colli, scaleni, rhomboidei, subclavius.	Filaments.
Muscular...........	Motion................	Musculospiral	Triceps, anconeus, supinat. long., extens. carpi rad. long., brach. antic.	Internal, posterior, external.
Muscular...........	Motion................	Median.............	Superficial muscles of forearm.	Filaments.
Muscular...........	Motion................	Ulnar................	Flexor carpi ulnaris, flexor profundus digitorum.	Two branches.
Muscular...........	Motion................	Great sciatic.........	Biceps, semimembranosus, semitendinosus, adductor magnus.	Filaments.
Muscular...........	Motion................	Sacral plexus........	Pyriformis, obturator int., gemelli, quad. femoris.	Filaments.
Muscular...........	Motion................	Anterior crural	Pectineus and muscles of thigh.	Filaments.
Musculocutaneous ...	Motion and sensation...	Brachial plexus......	Coracobrach., biceps, brach. anticus, forearm.	Anterior and posterior.
Musculocutaneous ...	Motion and sensation...	External popliteal....	Muscles of fibular side of leg, skin of dorsum of foot.	Internal, external.
Musculospiral	Motion and sensation...	Brachial plexus......	Back of arm and forearm, skin of back of hand.	Musculocutaneous, radial, posterior interosseous.
Mylohyoid	Motion................	Inferior maxillary....	Mylohyoid and digastric muscles.	Filaments.
Nasal..............	Sensation.............	Dental, anterior......	Mucous membrane of inferior meatus.	Filaments.
Nasal..............	Sensation.............	Maxillary, superior...	Integument of lateral aspect of nose.	Filaments.
Nasal..............	Sensation.............	Ophthalmic..........	Iris, ciliary ganglion, nose.	Ganglionic, ciliary, infratrochlear.
Obturator..........	Motion and sensation...	Lumbar plexus, third and fourth nerves.	Obturator externus, adductors, joint and skin.	Ant. and post. articulating and communicating.
Obturator (accessory).	Motion and sensation...	Lumbar plexus.......	Pectineus and hip-joint ..	Filaments.
Occipital, smallest or 3d.	Sensation.............	Third cervical........	Integument of occiput....	Filaments.
Occipitalis, lesser or minor.	Sensation.............	Second cervical......	Occipitofrontalis, ear, etc.	Communicating, auricular, filaments.
Occipitalis magnus...	Motion and sensation...	Second cervical......	Complexus, trap. and scalp.	Filaments.
Oculomotor	See *Motor oculi.*			
Olfactory (first cranial).	Smell................	Frontal lobe, optic thalamus and insula.	Schneiderian membrane of nose.	Twenty branches.
Ophthalmic.........	Sensation.............	Trigeminus..........	Forehead, eyes, nose......	Frontal, lacrimal, nasal.

NERVES, TABLE OF PRINCIPAL.

Name.	Function.	Origin.	Distribution.	Branches.
Optic (second cranial).	Sight	Cortical center in occipital lobe.	Retina	None.
Orbital	Sensation	Superior maxillary	Temple and cheek	Temporal and malar.
Palmar cutaneous	Sensation	Median	Thumb and palm	Outer and inner.
Palmar (deep)	Motion	Ulnar	Little finger, dorsal and palmar interosseous, two inner lumbricales, abductor pollicis.	Filaments.
Palmar (superficial)	Sensation and motion	Ulnar	Palmaris brevis, inner side of hand and little finger.	Filaments and two digital branches
Palpebral	Motor	Superior maxillary	Integument of lower lid	Filaments.
Parotid	Sensation	Auriculotemporal	Parotid gland	Filaments.
Patheticus (4th cranial).	Motion	Valve of Vieussens	Superior oblique of eye	None.
Pectineus	Motion	Anterior crural	Pectineus muscle	Filaments.
Perineal	Motion and sensation	Pudic	Perineum, genitalia and skin of perineal reigon.	Cutaneous and muscular.
Perineal	Motion and sensation	Fourth sacral	External sphincter ani and integument of anus.	Filaments.
Peroneal communicating.	Sensation	External popliteal	Connecting external popliteal with short saphenous.	None.
Phrenic	Motion and sensation	Third, fourth, and fifth cervical.	Diaphram, pericardium, pleura.	Filaments.
Plantar (external)	Motion and sensation	Posterior tibial	Little toe and deep muscles of foot.	Superficial and deep.
Plantar (internal)	Sensation and motion	Posterior tibial	Sole of foot, adduct. pollic., flexor brev. dig., toes.	Cutaneous, muscular, articular, digital.
Pneumogastric (tenth cranial ("par vagum").	Sensation and motion	Floor of fourth ventricle.	Ear, pharynx, larynx, heart, lungs, esophagus, stomach.	Auricular, pharyngeal, superior and inferior laryngeal, recurrent laryngeal, cardiac, pulmonary, esophageal, gastric, hepatic, communicating, meningeal.
Popliteal (external)	Sensation and motion	Great sciatic	Extensors of foot, skin, and fascia.	Anterior tibial, musculocutaneous, articular, cutaneous.
Popliteal (internal)	Motion and sensation	Great sciatic	Knee, gastrocnemius, tibialis posticus, plantaris, soleus, popliteus, skin of foot.	Articular, muscular, cutaneous, external saphenous, plantar, external or short saphenous.
Pudendal, long (nerve of Soemmering).	Sensation	Small sciatic	Integument of genitalia and inner and proximal part of thigh.	Filaments.
Pudic	Motion and sensation	Sacral plexus	Perineum, anus, genitalia.	Inferior hemorrhoidal, perineal, cutaneous, dorsal of penis.
Radial	Sensation	Musculocutaneous	Thumb and three fingers.	External and internal.
Sacral (five)	Motion and sensation	Cord	Multifidus spinæ, skin, gluteal region.	Filaments and sacral plexus..
Saphenous (external or short).	Sensation	Internal popliteal	Integument of foot and little toe.	Filaments.

NERVES, TABLE OF PRINCIPAL.

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES
Saphenous (long or internal).	Sensation	Anterior crural	Knee, ankle	Cutaneous, patellar, communicating, filaments.
Sciatic (great)	Motion and sensation	Sacral plexus	Skin of leg, muscles of back of thigh and those of leg and foot.	Articular, muscular, popliteals.
Sciatic (small)	Sensation and motion	Sacral plexus	Perineum, back of thigh and leg, gluteus maximus.	Muscular, cutaneous, long pudendal.
Spinal accessory (eleventh cranial).	Motion	Floor of fourth ventricle.	Sternocleidomastoid, trapezius.	Filaments.
Splanchnic (great)	Sympathetic	Thoracic ganglia	Semilunar ganglion, renal and suprarenal plexuses.	Communicating and filaments.
Splanchnic (lesser)	Sympathetic	Tenth and eleventh thoracic ganglia, great splanchnic.	Celiac plexus and great splanchnic.	Communicating and filaments.
Splanchnic (renal or smallest).	Sympathetic	Last thoracic ganglion	Renal and celiac plexus	Communicating and filaments.
Stylohyoid	Motion	Facial	Stylohyoid muscle	Filaments.
Subscapular (three)	Motion	Brachial plexus	Subscapular, teres major, and latissimus dorsi.	Filaments.
Supraacromial	Sensation	Cervical plexus	Skin over deltoid	Filaments.
Supraclavicular (descending).	Sensation	Third and fourth cervical.	Skin of neck, breast and shoulder.	Sternal, clavicular, acromial.
Supramandibular	See *Maxillary, superior.*			
Supramaxillary	See *Maxillary, superior.*			
Supraorbital	Sensation	Ophthalmic	Upper lid, forehead	Muscular, cutaneous and pericranial branches.
Suprascapular	Motion and sensation	Brachial plexus	Scapular muscles	Filaments.
Supratrochlear	Sensation	Ophthalmic	Forehead and upper eyelid.	Muscular and cutaneous.
Temporal	Motion	Inferior maxillary	Temporal muscle	Filaments.
Temporal	Sensation	Orbital	Integument over temporal muscle.	Filaments.
Temporal	Motion	Temporofacial	Orbicularis palpebrarum, occipitofrontalis, attrahens and attollens aurem, corrugator supercilii.	Muscular.
Temporal, superficial	Sensation	Auriculotemporal	Integument over temporal fascia.	Filaments.
Temporofacial	Motion	Facial	Upper part of face	Temporal, malar, infraorbital.
Thoracic (ant. and ext.).	Motion	Brachial plexus	Pectoralis major et minor.	Filaments.
Thoracic (posterior or long). External respiratory nerve of Bell.	Motion	Brachial plexus	Serratus magnus	Filaments.
Tibial (anterior)	Motion and sensation	External popliteal	Tibialis antic., extensor long. digit., peroneus ter., joints of foot, skin of great toe.	Muscular, external, internal.

NERVES, TABLE OF PRINCIPAL.

NAME.	FUNCTION.	ORIGIN.	DISTRIBUTION.	BRANCHES.
Tibial (posterior)....	Motion and sensation...	Internal popliteal....	Tibialis post., flexor long. digit., flexor long. pollic., skin of heel and sole, knee-joint.	Plantars, muscular, calcaneoplantar, cutaneous or internal calcanean, articular.
Tonsillar............	Sensation.............	Glossopharyngeal.....	Tonsil, soft palate, and fauces.	Filaments.
Trigeminus or trifacial (fifth cranial).	Motion and sensation (taste).	Medulla and floor of fourth ventricle.	Skin and structures of face, tongue and teeth.	Ophthalmic, superior and inferior max. divisions.
Trochlear...........	See *Patheticus*.			
Ulnar..............	Motion and sensation...	Brachial plexus......	Muscles, shoulder-joint and wrist-joint, and skin of little finger.	Two articular, muscular, palmar cutaneous, dorsal, superior palmar, deep palmar.
Vagus..............	See *Pneumogastric*.			
Vidian.............	Sensation.............	Union of large superficial and deep petrosal.	Sphenomaxillary fossa, and posterior part of upper nasal meatus.	Filaments, nasal.

NERVES, DISEASES.—See NEURALGIA, NEURITIS, NEUROMA, etc.

NERVES, INJURIES. Wounds.—A nerve may be completely or partially divided, and the wound may be incised, lacerated, contused, or punctured.

The effects of wounds of nerves, in addition to the degeneration of the portion below the wound, are: (1) Paralysis of motion and sensation of the parts supplied by the nerve; (2) subsequent wasting, atrophy, and fatty degeneration of the paralyzed muscles; (3) certain trophic changes in the tissues whose nutrition is presided over by the injured nerve, such as a glazed, smooth, cold, and bluish-red condition of the skin, falling off of the hair, cracking and deformity of the nails, local ulcerations and gangrene of the fingers, etc.; (4) a marked diminution in the temperature of the part, which may be preceded for a few days or even a few weeks by a slight increase of 2 or 3 degrees; (5) affections of the joints resembling rheumatism, and apt to terminate in more or less complete ankylosis; (6) ascending neuritis, which is attended by severe pain in the cicatrix and shooting up the nerve, and pain in the area of its distribution; and (7), very rarely, changes in the nerve-centers of a functional or of an organic nature (Walsham).

Symptoms.—The immediate symptoms are loss of function in the parts supplied by the nerve—viz., muscular paralysis, local anesthesia, or loss of special sense—according as a motor, sensory, or nerve of special sense is injured. In the case of a mixed nerve, both motion and sensation will be lost; but sensation in some instances may be partially restored in a few days through anastomosing branches from other nerves. The remoter symptoms are wasting of the muscles, and the trophic changes of the skin, nails, etc., already alluded to, and sometimes pain in the cicatrix, and in the course of the nerve and its peripheral distribution. The muscles exhibit to electric tests the *reaction of degeneration*—*i. e.*, they do not respond to the faradic current, but contract on the application of a continuous current of less strength than that necessary to cause the contraction of normal muscles; the contraction elicited, moreover, is slow, long, and tetanic; and the sequence of polar reaction is altered (*ACC.*> *CCC.* instead of *CCC.*> *ACC.*). Their response, however, to the continuous current becomes feebler until they finally cease to contract. As a consequence of the degeneration of the affected muscles, their opponents undergo adaptive shortening, thus producing various deformities: as, for example, the hammer fingers (*main en griffe*) seen after division of the ulnar nerve.

The treatment varies according as the wound of the nerve is recent or of long standing. In the former case the nerve should be sought in the wound, the divided end sutured, the limb placed at rest on a splint in such a position that the united ends are not subjected to tension, and every effort subsequently made to obtain healing of the wound of the soft parts by first intention. If the divided ends of the nerve are lacerated or contused, the injured portions should be cleanly cut away before applying the sutures. If the nerve is only partially divided, the divided parts should be sutured. The sutures, consisting of fine China-silk twist, should be passed with a small curved needle through the sheath of the nerve in 4 or 5 places. In every recent wound it should be as much a matter of routine to suture large nerves, if divided, as to tie wounded arteries. If the nerve does not unite, an attempt may be made to procure union after the wound is healed, as may also be done in long-standing cases of nonunion, though many months or even a year or two may have elapsed. An incision over the ununited ends should be made parallel to the nerve, the bulbous upper end of which can generally be felt through the soft tissues. The ends, which may have retracted so as to be an inch or more apart, should be sought, the bulbous ends shaved away little by little with a sharp scalpel until plenty of nerve-fibers are seen on the surface of the section, the lower end also refreshed, and the two united in the manner described above. When the ends are embedded in much cicatricial tissue, they should be freed by careful dissection, and when much separated, stretched so as to bring them into apposition. If the nerve is only partially divided, and the divided portions are bound down by cicatrical tissue, the injured segment of nerve, in its entire thickness, should be cut away before applying the sutures. In some instances sensation may return within 24 hours of suture; but it may be more than a year in long-standing cases before the function of the nerve is restored. In the meanwhile the nutrition of the parts supplied by it should be promoted by warmth, and the muscles prevented as much as possible from degenerating by galvanism, massage, friction, and passive movements (Walsham).

Transplantation of nerves, or **nerve-grafting,** has become a recognized surgical procedure. In some cases, also, a piece of nerve has been taken from an animal for the purpose. An attempt to restore the function of the nerve in this way may be made when the proximal and the distal ends of a divided nerve cannot be brought into apposition: as, for instance, after a portion of nerve has been destroyed in a compound fracture, or after a porton of nerve, damaged by the contraction of cicatricial tissue, by the formation of callus, or by the growth of a tumor in its substance, has been removed. The conditions for success are: great care in dissecting out and handling the nerve, its immediate transference, the employment of a single suture at each end, the avoidance of all tension, strict asepsis, and immediate union of the wound of the soft parts.

Subcutaneous rupture of a nerve is rare, but is occasionally met with as the result of a severe twist or wrench. It is attended with severe pain at the time of injury, perhaps also referred to the periphery of the nerve, and the gradual formation of a bulbous swelling on the nerve immediately above the rupture. The same effects follow as in division of a nerve in an open wound. The treatment is also similar.

Compression of a nerve occasions numbness and tingling, and, if severe and prolonged, partial or complete paralysis of the parts supplied by it, and the series of changes already described. As examples may be mentioned crutch-palsy, due to the pressure of a crutch upon the large nerves in the axilla; the dropped wrist, from the involvement of the musculospiral nerve in the callus in fracture of the humerus; the tingling, numbness, and partial paralysis sometimes following dislocations of the shoulder from the pressure of the head of the displaced bone on the brachial plexus; the pain caused by the pressure of a tumor on a nerve; the "pins and needles" felt in the feet, after sitting on the edge of a chair, from compression of the sciatic nerve, etc.

The treatment consists in releasing, if practicable, the nerve from the compressing agent. If a wound of the soft tissues is necessary to accomplish this object, healing without suppuration should be obtained, if possible, as otherwise the nerve may again become compressed by the resulting scar-tissue.

Contusions.—A familiar example of this injury is a blow on the ulnar nerve, as it lies behind the internal condyle. There is intense pain at the spot struck, and shooting and "pins-and-needles" pains in the parts supplied by the nerve. These symptoms pass off shortly, but occasionally they may be more severe and last for several weeks, in which case there is probably some effusion of blood in the nerve. In rare instances ascending neuritis, persistent neuralgia, or even paralysis, and changes similar to those observed after complete division of a nerve, may follow.

Foreign Bodies.—A portion of a needle broken off in a nerve, the lodgment of small shot from a gun accident, etc., may give rise to inflammation of the nerve, persistent irritation and pain at the injured spot, spasm in the muscles. and pain or tingling in the parts supplied by the nerve. Such accidents have occasionally been followed by epileptiform convulsions. The treatment is to cut down upon and remove the foreign body.

NERVOUS DISEASES, EXAMINATION.

Mode of Procedure in Diagnosing Diseases of the Nervous System.

In making a diagnosis of diseases of the nervous system it is frequently advisable to resort to the plan of exclusion, and in this manner to eliminate such disorders as rheumatism, gout, and diseases of the joints, affections which disturb sensation or motion, or both. As syphilis is a very common cause, in diseases of the nervous system the possibility of such infection, even many years before the onset of the nervous symptoms, should be determined. For a full discussion of the diagnosis of syphilis, see SYPHILIS.

In all lesions of the nervous system there is either a disturbance of motion or of sensation, or of both. In some there is a disturbance of the special senses or of consciousness. It is necessary then to separate diseases of the brain, diseases of the cord, and diseases of the peripheral nervous system. The elimination of eyestrain is of paramount importance in all nervous disorders.

A careful history will eliminate such conditions as gout, rheumatism, and joint affections. After these factors have been eliminated, it is determined whether or not the lesion is within the brain, in the spinal cord, or in the peripheral nerves. Spinal curvature may be found to be the cause.

Symptoms of Diseases of Brain, Spinal Cord, and Peripheral Nerves.

Lesions of Brain.	Lesions of Cord.	Lesions of Peripheral Nerves
1. Disturbances of consciousness.	1. Consciousness usually preserved	1. Consciousness preserved.
2. Disturbances of special sense, as hearing, smelling, tasting, feeling.	2. No disturbance of nerves of special sense.	2. No disturbance of nerves of special sense except feeling.
3. Delusions and hallucinations.	3. No delusions or hallucinations.	3. Mind usually normal.
4. Paralysis frequently involves arms.	4. Paralysis frequently involves legs.	4. Paralysis may involve arm or leg, most frequently the latter.
5. Convulsions common.	5. Convulsions rare.	5. Convulsions rare.
6. Vomiting common.	6. Vomiting not common, except in tabes dorsalis.	6. Vomiting uncommon.
7. Sphincters frequently involved.	7. Sphincters frequently involved.	7. Usually control of sphincters.

Systematic Study of Diseases of the Nervous System.

(1) Disturbances of motion; (2) disturbances of sensation; (3) disturbances of nutrition; (4) disturbances of consciousness; (5) disturbances of special sense; (6) psychic disturbances.

Paralysis.

Varieties.—1. **Irregular paralysis,** arising from various regions of brain, giving rise to optic neuritis, vomiting, strabismus; or, if in the cord or peripheral nervous system, giving rise to paraplegia, neuritis, etc.

2. **Monoplegia,** arising from brain, as seen in small hemorrhage into cortical layer; or may arise from disease of peripheral nerve, as from traumatism.

3. **Hemiplegia.**—Hemorrhage into the cerebrum is the most common cause. Hemorrhages into cerebellum and crus cerebri are very rare.

Paraplegia may arise from hemorrhage into brain or cord, or it may arise from disease of peripheral nerves, as in multiple neuritis.

Convulsions.

Varieties.—(1) Epileptiform; (2) tetanic; (3) hysteroid; (4) local.

In **epileptiform convulsion** consciousness is lost, and there are clonic spasms.

Tetanic convulsions are usually accompanied by consciousness, and the muscles most frequently affected are the muscles of the jaws and of deglutition. They occur in tetanus, strychnin-poisoning, tetany and spinal meningitis.

Hysteroid convulsions occur in hysteria; consciousness may or may not be present.

Local convulsions or **spasms** frequently affect the face, causing momentary spasms, as is seen in tic douloureux, which results from neuralgia of the fifth nerve.

Saltatory Spasm.—A transient or permanent condition allied to hysteria in which the attempt to stand results in a sudden violent contraction of the leg muscles.

Tremors.

Tremors are involuntary vibratory movements and are produced by alternate contraction and relaxation of antagonistic muscles. They are observed most often in the arms, head, face, tongue, and hands. They may be *coarse* or *fine*. Tremors occur in chronic alcoholism, delirium tremens, paralysis agitans, and in poisoning by lead, mercury, arsenic, chloral and opium. Neurasthenia, debility from various causes, senility, hysteria, disseminated sclerosis, and paresis are accompanied by tremors. In *disseminated sclerosis*, the tremor is irregular, jerky, and increased by voluntary efforts to restrain it. The tremor is absent during rest but is brought about by movement. In *paralysis agitans*, it is regular and rhythmic, occurring both during rest and movement. The tremor of *senility* is exceedingly fine and begins in the hands, often extending to the face. It occurs at first only during motion, disappearing during rest. When age is far advanced it may occur during both rest and movement.

Choreiform movements are coarse, incoordinated, involuntary movements of a jerky and irregular character usually separated by short intervals. They may simulate, to some extent, purposeful movements. Among the causes may be mentioned idiopathic chorea, Huntingdon's chorea, posthemiplegic chorea, organic brain disease, habit, hysteria, reflex irritation, etc.

Athetoid movements are slow, more or less rhythmic twisting movements of the fingers and toes. They are observed in cerebral palsies of children, after hemiplegia in adults, and polioencephalitis.

The Gait.

The Ataxic Gait.—In locomotor ataxia the characteristic development of incoordination of movements comes on slowly. It is frequently observed by the patient from the inability to walk after dark. The characteristic gait is manifested by the fact that the foot is raised high in the air with a rotatory motion, and is dropped quickly so that the whole of the sole strikes the floor at the same time.

The Spastic Gait.—In spastic paraplegia or lateral sclerosis, the gait is manifested by the legs being dragged behind the patient, the toes frequently scraping the ground; the knees seem to come together, and the limbs may shake from the clonus which may be present.

Festination is observed in paralysis agitans. In this movement the patient appears to be in the act of falling forward, when the steps become faster and faster, then suddenly cease, and the patient may fall backward or on the side, should he receive no support from in front.

The Gait of Pseudomuscular Hypertrophy.—The limbs are generally well nourished, frequently greatly enlarged, and in walking the feet are thrown outward straddling; the abdomen is greatly enlarged, and the body movements are slow and awkward.

Titubation is observed in diseases of cerebellum. It may be mistaken for the gait of locomotor ataxia, except that it is more irregular. If the patient is put in the reclining attitude, the motions may be perfectly controlled, while in locomotor ataxia there is partial loss of voluntary motion, as is seen when the patient tries to touch the tip of the nose when the eyes are closed.

In *myotonia* (*q. v.*) any muscular action such as walking is begun with difficulty. The stiffness gradually, however, disappears and progression is easy.

In *intermittent claudication* (*q. v.*) walking is associated with rigidity, numbness, cramps, weakness and disorders of sensation.

The Reflexes.

As a rule, when the "reflexes" are spoken of in diseases of the nervous system, the tendon or patellar reflex of the knee-joint is meant: this is probably due to the contraction of the muscle itself, brought about by its normal irritability. As the impulse communicated to the muscle is transmitted through the medium of the spinal cord, it may be said that the reflexes are governed by this portion of the nervous system.

The Knee-jerk or Patellar Reflex.—This symptom is elicited by having patient cross the knees while in a sitting posture, and after distracting attention, gentle taps are made over quadriceps tendon immediately below the patella.

The knee-jerk is increased in lateral sclerosis, disseminated sclerosis, incomplete lesions of the cord above the lumbar segment, irritability of the spinal cord such as occurs in spinal meningitis, strychnin poisoning, hysteria, etc., and in some cases of organic cerebral disease.

The knee-jerk is decreased in locomotor ataxia, neuritis, pseudomuscular hypertrophy, poliomyelitis, myelitis, and in poisoning by spinal depressant drugs. Pronounced physical exhaustion also serves to lessen the tendon reflexes.

Ankle-clonus.—This symptom is elicted by allowing patient to cross the knees, and by elevating the foot so that the entire limb is on the same plane, then, by a sudden push upward, there is a tremulous movement or vibration communicated to the hand, frequently lasting for many seconds.

The *Babinski reflex* is the extension of the great toe which follows tickling the sole of the foot. Normally flexion follows such a procedure. The reflex occurs most often in hemiplegia, diplegia, and diseases of the motor tract of the cord.

Arm-jerk and jaw-jerk are also frequently elicited.

Paradoxic contraction, a peculiar phenomenon allied to the reflexes, first studied by Westphal, is occasionally noted. Its cause is unknown. In the *tibialis anticus* muscle it is induced by forcibly flexing the foot on the leg. As a result, the foot remains thus flexed for a considerable time, then slowly relaxes. On repeating the flexion, the tetanic contraction recurs, but the response gradually diminishes in intensity. Contractions induced by faradism may similarly persist. More rarely it may be induced in the flexors of the leg and forearms. It has been observed in early tabes dorsalis, multiple sclerosis, hysteria, and paralysis agitans.

Vasomotor Disturbances.

Paralysis of the vasomotor system occurs as a symptom of hysteria, neurasthenia, and other functional neuroses, and follows injuries of the sympathetic nerve. It is manifested by abnormal redness of the skin with a sensation of heat and a rise in the dermal temperature. Vasomôtor spasm is indicated by pallor and coolness of the skin with formication and stiffness. It is observed with functional disturbances of the sympathetic system and may be followed by trophic disturbances such as occur in scleroderma and symmetric gangrene.

Disturbances of Sensation.

Loss of sensation is most common. This is called **anesthesia. Hyperesthesia** is a condition in which the sensation is increased above the normal. **Paresthesia** consists of abnormal sensations, such as "pins-and-needles" pains. Subjective painful sensations or nerve ache is known as **neuralgia.**

Areas of anesthesia may be determined by the prick of a pin, by the finger stroke, by the application of heat (flame or coal) or cold (ice), and by the faradic current. **Monanesthesia** is a condition in which the sensation is lost in but one member. **Hemianesthesia** means loss of sensation over the lateral half of the body. **Analgesia** means insensibility to pain. It is met with in hysteria and syringomyelia especially.

Disturbances of Consciousness.

The principal alterations to which consciousness is subject in nervous diseases are coma, trance, somnambulism, ecstasy, and catalepsy.

Coma is an abnormally deep and prolonged sleep in which the cerebral functions are in abeyance, characterized by stertorous breathing, relaxation of the sphincters, lividity of the face, loss of parallelism of the optic axes, and an inability to respond to external stimuli. It may be gradual or sudden in its onset; complete or partial, transient or permanent. It may be due to organic brain disease, traumatism, cerebral anemia, epilepsy, sunstroke, hysteria, various convulsive states, and various toxic agents in the blood, introduced either from without or produced within the body.

Trance is an hysteric manifestation characterized by a prolonged abnormal sleep from which the patient cannot be aroused and in which the vital functions are reduced to a minimum.

Somnambulism is a condition of half-sleep in which the senses are but partially suspended and the patient is able to perform various feats automatically. Ordinary sleep-walking may occur in health but the more pronounced varieties of this condition are observed in hysteria and in hypnotized subjects.

Ecstasy is a peculiar state of the mind in which a delusion so governs the mental functions that the entire nervous system is held in a condition of subjection or apparent insensibility. It is usually an hysteric manifestation.

Catalepsy is characterized by loss of will and by muscular rigidity. It occurs in paroxysms with loss of consciousness, the limbs remaining for long periods in any position in which they are placed. It occurs in hysteria, various psychoses, hypnotic states, and organic brain disease.

Disturbances of the Special Senses.

Miosis, or contraction of the pupil, frequently occurs in opium-poisoning, locomotor ataxia paretic dementia, and uremia.

Inequality of the pupils may be found in such conditions as organic brain-disease, locomotor ataxia, and paretic dementia.

The Argyll Robertson pupil occurs in locomotor ataxia. In this phenomenon the pupil fails to respond to light, but accommodates for distance. See PUPIL.

Nystagmus.—A peculiar condition of the eyeball in which an outward and an inward oscillation occurs. It may be observed in disseminated sclerosis and diseases at the base of the brain.

Ocular movements are often impaired or paralyzed, and the muscles involved give evidence of the nervous lesion. See EYE-MUSCLES.

The Ear.

Tinnitus aurium is a peculiar ringing or buzzing sound in the ear observed in middle-ear or Ménière's disease. It may be produced by administering large doses of quinin or salicylic acid. See EAR.

Psychic Disturbances.

Delusion.—By this is meant a faulty belief concerning a subject of physical demonstration, out of which the person cannot be reasoned by adequate methods for the time being (Wood).

Illusion means a perverted conception, attributing life and motion to inanimate things.

Hallucination.—A false perception. Frequently occurs in the insane, and is one in which the patient appears to hear voices and to see faces where none exist.

Morbid Impulse.—An irresistible desire to commit an act which the patient knows to be wrong (Stevens).

Disturbances of Nutrition. (*Trophic Derangements.*)

By this term is meant changes in the nerves and muscles of a part, giving rise to a change in the contractility when a galvanic battery is applied and resulting also in muscular atrophy, arthropathies, ulcerations, and trophic affections of the skin, nails and hair. These trophic or nutritive phenomena are closely related to vasomotor phenomena.

Reaction of Degeneration.

To determine this reaction, a galvanic battery of moderate strength should be used. The battery should always be tested by dipping the sponges in a weak saline solution or in water. In the galvanic battery there are what are termed the *anode*, or positive pole, and the *kathode*, or negative pole. By placing the kathode over a normal muscle and closing the circuit, a strong contraction occurs; when the anode is placed over the normal muscle, the contraction is greatly lessened. There is no contraction in either case when the circuit is broken. With a strong galvanic current contractions of the normal muscle occur, and the anodal is greater than the kathodal. In the reaction of degeneration all these reactions are altered or even reversed.

Another simple degenerative reaction is given by Gowers, who states that the faradic irritability is lost, while the galvanic irritability is increased, and often changed in quality.

The circuit of a galvanic battery is said to be *closed*, *made*, or *complete* when the elements are connected outside of the fluid.

NEURALGIA.—A severe paroxysmal pain in the area of distribution of a nerve or along its course.

Etiology.—Age, sex, heredity, and anemia are important predisposing causes. The true nature of neuralgia is obscure; it is possible that in many cases the cause is an inflammatory or circulatory disturbance in the nerve-trunk. Among exciting causes, cold and traumatism play an important rôle. Certain disease-poisons, as those of typhoid fever, variola, malaria, and *metallic* poisons, such as lead, arsenic, copper, mercury, in addition to alcohol and nicotin, are sometimes causative agents of neuralgia. Gout and diabetes also occasionally give rise to neuralgia. Finally, there is a class of so-called reflex neuralgias, such as those due to eye-strain and those met with in connection with uterine and ovarian disease and occurring in remote organs. Lesions of the central nervous system also give rise to attacks of neuralgic pain.

Varieties.—According to the nerves involved, the following varieties occur: Trifacial, or tic douloureux (prosopalgia); cervicooccipital, cervicobrachial, and brachial neuralgias; neuralgia of the phrenic nerve; neuralgias of the trunk, such as dorsointercostal, lumboabdominal, and possibly pleurodynia; neuralgia of the spinal column, sacral neuralgia, and coccygodynia; neuralgia of the feet; and visceral neuralgia. The fifth nerve is a favorite seat for reflex neuralgias.

Symptoms.—Pain is the most important symptom. It is of a spontaneous nature; occurs in paroxysms; runs along the course of the nerve by the nervi nervorum; and is of a darting, burning character. These paroxysms, lasting from a few moments to some hours, may return at regular intervals. Certain tender points exist along the course of the nerve, usually where the nerve passes from a deeper to a more superficial position. These pains are supposed to be caused by sudden explosions in the ganglionic cells in the gray matter of the cerebrum, where all nerve-fibers terminate. Other symptoms of neuralgia are numbness, transient hyperesthesia, vomiting and various vasomotor disturbances.

Diagnosis is usually easy. Neuralgia may be distinguished from organic disease of a part by the presence of great superficial tenderness, by a hysteric temperament, and by the absence of all the other symptoms of organic disease; from neuritis, by the intermittent nature of the pain, by its occurring in hysteric subjects, and by the absence of the constitutional symptoms of inflammation. When neuritis and neuralgia exist together, the diagnosis may be difficult. Here the presence of superficial tenderness and a relief of the pain by deep pressure points to neuralgia, while in neuritis, on deep pressure the pain is extreme. The severe forms of neuritis are followed by anesthesia and muscular wasting, with changes in muscular irritability. In compression of nerves the pain is continuous, and the symptoms and consequences of neuritis will sooner or later ensue. Muscular rheumatism differs in its localization in muscles and groups of muscles. It is continuous, and the pain increases on motion.

The treatment of pain during the paroxysm calls for the administration of powerful anodynes. Morphin and opium and their preparations are foremost, and should be given in full doses by the mouth or hypodermically. Acupuncture and hypodermic medication may be combined. In sciatica this is probably the best treatment. Cocain hypodermically (1/4 of a grain) may be preferred to morphin.

Ammonium chlorid, 20 grains in solution, may be given every 4 hours. Quinin is to be used when a malarial origin is suspected. Antipyrin, acetanilid, acetphenetidin, and salol sometimes act with rapidity. Exalgin gives relief, but without diminishing the tendency to future paroxysms. The following may be administered:

℞.	Acetanilid,	gr. xx
	Citrated caffein,	gr. x
	Camphor monobromate,	gr. v.

Make 10 pills; give 1 pill every 2 hours.

Cannabis indica, in doses of 1/2 grain of the extract, is efficacious in neuralgias of the pelvic region and in neuralgia in migraine sufferers. Gelsemium and its alkaloids are valuable for the affection confined to the dental branches of the fifth nerve. Chloral has been recommended, but almost always fails. Croton-chloral or butyl-chloral has been recommended for neuralgia of the fifth nerve. It may be administered to advantage in combination with cannabis indica, as follows:

℞.	Butyl-chloral hydrate,	gr. c
	Extract of cannabis indica,	gr. ijss.

Divide into 20 pills. Give 1 pill every 3 hours.

Chloroform and ether may be used as inhalations, to give speedy relief in desperate attacks of neuralgia, while amyl nitrite, nitroglycerin, and other nitrites give the best chance of relief in cardiac neuralgic conditions. Recently, castor oil has been highly recommended. It is given before breakfast in doses of from 1 to 2 ounces.

Belladonna and atropin are drugs long employed in the treatment of neuralgia. They are probably of more benefit in the abdominal and pelvic varieties than in facial neuralgia. Belladonna is used locally, moreover, often with relief. Hyoscyamus, hyoscin, and stramonium are employed in much the same way as belladonna. The following may be tried:

℞. Tincture of hyoscyamus,
Tincture of stramonium,
Tincture of belladonna, } each, ʒ iv.

Give 25 drops in a tablespoonful of water every 4 hours.

Of local applications, pressure may relieve mild cases. Menthol, ointments of veratrin and aconite, the tincture of aconite painted over an involved area, the extract of belladonna, thinned with glycerin, and the oleate of morphin are of service. Blisters, (by chloroform, either pure or diluted) sinapisms and camphor may be used. Cocain will act on mucous surfaces, but not on the skin. Acupuncture and aquapuncture are employed. Chloroform, osmic acid, and phenol have been injected hypodermically.

Freezing the part with ether spray often proves useful. The continuous electric current may be used, placing the positive sponge near the seat of pain, and with the negative gently rubbing the neuralgic spot until the skin is slightly reddened, and until it causes a faint tingling or burning, but not pain.

In the most intractable cases the surgical means that may be tried are nerve stretching or excision of a portion of the nerve. Of the two operations the latter is to be preferred, but too often the pain returns after it. In fact, the operation can only be of use when the pain is peripheral, due to some irritation existing between the part cut and the ends of the nerve. If the neuralgia depends upon any central cause, or if the irritation exists higher up than the point divided, the operation has always eventually failed, although at times a temporary cessation of pain for a few weeks has occurred. See LUMBAGO, SCIATICA, etc.

NEURASTHENIA.—Neurasthenia is a nervous state or condition marked by irritable weakness. It is commonly known as nervous prostration or nervous exhaustion, and presents a great many variable and inconstant subjective symptoms and a few significant objective phenomena. All forms of nervous energy—mental, motor, and organic—are disturbed, so that fatigue in these various spheres is more quickly occasioned than in health.

Etiology.—The majority of cases occur during the age of reproductive activity, and the disorder is rare after the age of 50. It sometimes occurs in childhood and during adolescence in individuals of a pronounced neuropathic tendency. Both sexes are about equally subject to it. High altitude and extremes of climatic conditions favor its development. Hebrews, Slavs, and Scandinavians are especially subject to it. A neuropathic heredity commonly furnishes the field in which it develops. Debilitating conditions in the antecedents are very common; gout, rheumatism, tuberculosis, syphilis, excesses, malaria, and all the various cachexias in parents are likely to be followed by neurasthenia in the offspring.

Among the inciting causes, overwork or overstrain of any kind is the most potent. Anxiety, worry, disappointment, excesses, deprivation of sleep, and anything that makes continuous and exacting demands upon the endurance of patients may induce this condition of nervous exhaustion. Traumatism, especially when attended by fright and shock, and mental shocks of all varieties may induce it with great readiness and sometimes suddenly. It may be symptomatic of or secondary to all sorts of chronic diseases and various toxic states, such as lithemia, alcoholism, and syphilis. Most cases present a multiplicity of predisposing exciting causes.

Dana sums up the leading causes of neurasthenia as follows:

1. Hereditary nerve instability.
2. Overwork and worry.
3. Severe shocks, with or without injury.
4. Infections.
5. Abuse of stimulants and narcotics.
6. Abuse of sexual functions.
7. Disorder of digestive functions and autotoxemia.

This means that the causes are most often a bad heredity and foolish living.

Pathology.—The pathologic anatomy of neurasthenia is not known. The best conception of the development of this disorder is obtained from a consideration of the changes which take place in motor cells when subjected to natural fatigue, as demonstrated by Hodge. It seems probable that when cells are continually overtaxed, recuperation and a full restoration of their potential energy do not take place except after a prolonged rest, and it is conceivable that in certain instances restoration may be impossible.

Symptoms.—The most important and commonly encountered symptoms in neurasthenia are headache, backache, gastrointestinal atony, neuromuscular weakness, cerebral depression, mental irritability, and insomnia. To these may be added an almost infinite number of subjective complaints, which vary in different cases, and even in the same case. They may all be considered systematically, as follows:

Motor Disorders.—Muscular weakness is constantly found. This is commonly demonstrated by the ready fatigue upon exertion. Often the patient is able to put forth an ordinary amount of strength for one or two efforts, and thereafter is left weak and trembling. Constant effort is impossible. Tremor is frequently present, and is easily provoked by muscular effort. It may be present in any of the extremities, and is often seen in the face and lips, especially when the patient is embarrassed or mentally disturbed. The tendon reflexes are generally intensified. This is particularly true of the knee-jerk. It sometimes happens that if the knee-jerk is repeatedly elicited, the exaggeration becomes less and less, showing the ready fatigue of the reflex arc. Irritability in muscles and nerve-trunks is sometimes demonstrable by sharply tapping the parts.

Sensory Disturbances.—Neurasthenics complain of many subjective sensory disturbances. A tired feeling is almost invariably present, and headache is one of the most common symptoms. It may be slight and constant, but more often is produced by muscular, and especially by mental, effort or by any disturbing emotion. Commonly occipital, it may be frontal, temporal, or vertical, and often is attended by a feeling of drawing in the back of the neck. The sensation as of a weight upon the head, a binding band around the brows, the lead-cap headache, are extremely common. Backache is usually present in neurasthenics, and is probably a fatigue symptom, though sometimes referable to a disturbance in the stomach and hypersensitiveness along the spine. Its common location is the small of the back, between the shoulders, and at the nape of the neck. It frequently results in the patients padding their chairs or retaining the recumbent position, and is usually intensified by any effort or disturbing circumstance. Tenderness of a superficial character is usually found over the spine, but sometimes is intensified by deep pressure. The spine may be sensitive its whole length, but usually presents a number of hypersensitive points. Near the occiput, over the seventh cervical spine, at the lower end of the scapula, at the waist, at the tip of the sacrum, and over the coccyx are favorable locations for these sensitive areas. Sensitiveness and spontaneous pain in various portions of the trunk and limbs are frequently present, but the outlines of these sensitive and painful areas are not sharply defined, and are likely to shift position and intensity within a period of a few minutes or hours. Various vague sensations of heat, cold, prickling, tightness, numbness, stiffness, weakness, fatigue, soreness upon pressure, etc., referred to various portions of the body and limbs, or to the internal organs, particularly the cardiac region, are constantly encountered. Those having reference to the pelvic and generative organs have in some cases a special prominence.

Visual Disturbance.—Neurasthenics find reading more or less irksome and often impossible. Headache, ocular distress, blurring of the letters, and other indications of eye-strain are readily induced. Another difficulty is furnished by inability to concentrate attention. Appropriate investigation usually demonstrates ready fatigue of the muscular apparatus of accommodation and a ready retinal exhaustion. In taking the chart of the visual fields it is a common experience to find them rapidly reduced within the course of a few minutes, and the fields for colors are usually concentrically contracted. Varying degrees of asthenopia mark a case of neurasthenia the same day, or even within the same hour. Heterophoric disturbances may be commonly encountered, but they are usually inconstant in their manifestations, and tend to disappear when the physical and nervous state of the patient is reestablished. Sometimes there is intense photophobia, keeping the patient within darkened rooms, due apparently to retinal hyperesthesia. Other patients complain of obscurities of vision. Hearing and smell may be intensified and irritable or weakened, but are never lost as a part of the neurasthenic symptom-group. Tinnitus and hyperacusia are sometimes encountered, and most neurasthenics are readily startled by sudden, slight, and insignificant noises. Complaints of disagreeable and peculiar odors and tastes are analogous disturbances.

Gastrointestinal Disorders.—Nervous indigestion is commonly encountered. The appetite is often capricious, but may be excessive or diminished. Sometimes the mere thought of food is repugnant. Gaseous eructations, borborygmi, gastric distention and dilatation, often attended by cardiac palpitation and precordial pain, are generally encountered in pronounced neurasthenia. Hydrochloric acid may disappear from the gastric secretion, and digestion is usually retarded and inefficient, with alternating constipation and diarrhea.

Circulatory Disorders.—Cardiac palpitation, due to gastric disturbance or provoked by slight mental or muscular activity, is commonly encountered, in some instances reaching an intense degree, attended by precordial pain, tumultuous heart action, throbbing and general distress, strongly suggestive of a stenocardial attack. The pulse ordinarily is rapid, and may range from 100 to 140, being promptly accelerated by any disturbing element. Anemic cases are likely to present exaggerated hemic murmurs, while the feebleness of the circulation is manifested in the cold extremities that are usually encountered. Vasomotor storms, sweating, flushing, and blushing are the rule, and these may be general, localized, or unilateral.

Secretory Disorders.—The urine is ordinarily scant and of high specific gravity, with a relative increase of uric acid or urea and a great abundance of phosphates and oxalates. In other instances the urine may be neutral or alkaline, and commonly at intervals neurasthenics pass a large quantity of limpid urine of a low specific gravity. Secretions—as the perspiration, saliva, and gastric, intestinal, and synovial fluids—are commonly deficient, but may be increased, or may increase and decrease from time to time.

Genital Disorders.—The average male neurasthenic complains of lessened sexual power, which is often at first attended by nocturnal emissions, and if the urine shows a little cloudiness, he is at once convinced that he has spermatorrhea. Any early indiscretions are likely to be recalled, and the patient may become extremely morbid regarding his genital tract. Impotence may actually exist. Women have analogous conditions.

Mental Disorders.—The mental state of neurasthenia is one of its most important features. All the mental activities show the element of irritable weakness. The capacity for mental work is abridged, yet at times neurasthenics have moments of great mental activity. Protracted mental effort, however, is irksome or impossible, the power of attention is reduced, memory for recent events becomes defective, and there is general mental asthenia. Active spontaneous mentation and the flow of ideas to which the patient has been accustomed do not take place so readily, sometimes leading them to fear that they are losing their minds, and they frequently state that they cannot think. Self-reliance and courage are frequently completely lost, so that the patient becomes suspicious of himself, apprehensive, introspective, and usually more or less hypochondriacal. Whatever feature of the disease strongly fixes his attention is dwelt upon, and he is likely to develop some one of the numerous nosophobias. The morbid self-watchfulness naturally leads to depression, and neurasthenics are always lacking in cheerfulness. Fears are their common portion. These usually are incited by some incident or have reference to some physical condition, and often become well-formulated delusions, which all but dominate the patient, and in certain instances become fixed insane delusions, then carrying the patient over the boundary into the field of alienism. In the lowered physical and mental state the patient has not the same interest in and affection for his friends and family; he becomes exacting, peevish, fretful, and despondent. The emotions are unstable; neurasthenics, from their fears and loss of courage, are easily moved to tears, and sometimes become markedly hysteric.

Sleep.—Disorder of sleep is one of the earliest features of neurasthenia, and frequently for a long time precedes other marked indications of the nervous state. As a rule, neurasthenics have difficulty in getting to sleep, ideas of one sort or another, usually unpleasant, pursue them to their beds, and even if they fall asleep, they are troubled by dreams of an unpleasant and often of an exciting, worrisome, and depressing character. Nightmares and formulated dreams of a disturbing sort are common in neurasthenia, and the patient, as a rule, awakes unrefreshed in the morning, being more despondent and hopeless than at night.

The Physical Condition.—In neurasthenia of long standing general nutrition is almost invariably affected, and all degrees of anemia and emaciation may be encountered. But neurasthenia of moderate degree and character is consistent with fair nutrition, and often with a certain amount of fatness. Some of the most inveterate neurasthenics become quite stout, but, as a rule, neurasthenics are nutritionally defective.

Forms.—Various forms of neurasthenia have been described, apparently depending upon the prominence of certain groups of symptoms. Spinal, cerebral, and sexual neurasthenias have been described, but neurasthenia is one and indivisible, and all portions of the nervous apparatus show the disorder to some degree. In proportion, however, as head, spine, or pelvic symptoms preponderate, the particular case is modified in a corresponding way, and most cases of so-called nervous dyspepsia are merely cases of neurasthenia with prominence of the gastric features. Very many neurasthenics, especially women, develop hysteria, and a combination, indicated by the term hysteroneurasthenia, is frequently encountered. It is very difficult to say when the disorders of neurasthenia become the defects of hysteria, and as a matter of clinical fact nearly all hysterics present some neurasthenia.

Course.—Neurasthenia is essentially chronic. Ordinarily its onset is insidious, but great moral, physical, or mental shocks may suddenly induce it. Once established, it tends to persist, and ordinarily the conditions which led to its development cannot be easily modified. Frequent remissions are presented, and patients once affected with neurasthenia are subject to relapses, even after long periods of freedom. In patients under adult years the disease is likely to improve spontaneously and to recur with readiness.

Diagnosis.—The diagnosis of neurasthenia is easy; the story of the neurasthenic usually suffices to make the diagnosis. The difficulty lies in overlooking some organic disease of which the neurasthenia may be symptomatic. A diagnosis of simple neurasthenia is never justified until all organic conditions have been investigated. Actual hypochondriasis and melancholia are to be differentiated.

Prognosis.—The prospects in neurasthenia are commonly good if the patient is below the age of 40 years and can be properly controlled and managed. This, however, is sometimes very difficult to accomplish, as circumstances may preclude that avoidance of fatigue and interruption of occupation usually necessary. If of a psychopathic stock, pronounced mental enfeeblement may occur, and should be apprehended. Occurring in patients before the age of 20, nervous prostration is likely to yield more or less readily, and to relapse frequently. After 40 the prognosis is less hopeful, as the neurasthenic exhaustion appears to have taken place in tissues that have lost their elasticity and recuperative powers, and complete recovery after this age is very exceptional. Cases of extreme emaciation often respond admirably to treatment, while some of the most inveterate instances do not present any considerable physical disorder. The presence of organic disease modifies the outlook in proportion as it is or is not manageable.

Treatment.—There is but one treatment for neurasthenia, and that is rest. Whatever function or quality of the individual has been overtaxed must be allowed an opportunity for recuperation. This is more easily said than accomplished. In cases of simple neurasthenia in women the Weir Mitchell rest cure usually is well advised, and oftentimes secures brilliant results. In men it is scarcely practicable, and usually fails when attempted. A change of scene, of atmosphere, freedom from suggestive surroundings, undue sympathy, and of well-meant but harmful solicitude, are generally of the first importance. The patient needs encouragement and all the hopeful suggestions that can in any way be brought to bear. In proper sanitariums this can be provided for the severe cases. In milder cases one should give up half his daily work, lie abed late in the morning, go to bed early at night, take a nap in the middle of the day receive small quantities of readily digested food at frequent intervals, strengthening applications of water in the form of cold spinal douches in the morning, and quieting applications of water at bedtime in the form of warm baths or packs. In addition the patient should drink a considerable quantity of water. Neurasthenics, as a rule, shun drinking-water. Elimination from the skin, bowels, and kidneys is greatly increased by these simple measures. Massage, salt baths, alcohol rubs, and general frictions serve a very good purpose in some cases, being refreshing and strengthening. Many patients who are greatly troubled with insomnia promptly drop off to sleep after a half-hour's gentle massage. Many of these patients need to see the physician frequently: the reiterated encouragement of the trusted adviser is often of more benefit than all other measures combined.

Office treatment in mild cases, by the use of one form or another of electricity, hypodermic injections of small doses of strychnin or of plain water, the use of dry cups, or any other means which serves to fix the attention of neurasthenics and give a helpful turn to their thoughts, may be properly used with the full understanding on the part of the physician of its suggestive value. Patients should not be allowed to constantly discuss their symptoms and fears with members of their family or any one else, and it is essential to provide for them a certain amount of recreation, which is not at the same time fatiguing. It is highly injudicious to advise a neurasthenic to ride horseback or a bicycle, or to attempt to turn the mind from his ailments by a course of reading or study. A vacation, with a change of air and scene, or a sea voyage, often answers perfectly in mild cases.

In the anemic and emaciated and severe cases the scale is the best index as to the success of treatment. A gain of a pound or so is most encouraging. The question of diet is, therefore, of extreme importance. Keeping in mind the gastrointestinal atony, it is necessary to supply food in a form that is easily assimilated and least liable to fermentation. Many of these patients will digest a small amount of food thoroughly, while double the amount will cause extreme distress. Therefore small quantities of food, particularly of the sorts that are easily digested, should be frequently administered.

The drug treatment of neurasthenia may be practically dismissed with a word. Large doses of strychnin should be condemned. Occasionally a hypnotic to reestablish the sleep habit may be given with decided advantage. The hypnotic should be selected with a view to its being in force at the time the restlessness is most prominent. If the warm bath and a glass of hot milk or of malted milk, or even of hot water, does not suffice to put the patient to sleep, a pint of beer, with a hot bath, may have the desired result. Should this fail, 10 grains of trional 2 hours before bedtime may be given. If the patient goes to sleep readily but wakes up after midnight, trional may be given in a dry powder at bedtime. Bromids, chloral, and opiates are to be avoided. Gastric disturbance may sometimes be relieved by subgallate of bismuth, small doses of calomel, beta-napthol, or other antiseptic preparations which inhibit fermentation. Constipation must be controlled. As a rule, the physician will best succeed in managing cases of neurasthenia in proportion as he understands their mental requirements and can, by a vigorous personality, override their fears and control their actions, thereby securing for them the curative rest which is partial or absolute in proportion to the severity of the disorder.

NEURITIS.—An inflammation of the nerve-trunks; characterized by pain and paresis of the parts supplied by the affected nerve-trunk.

Etiology.—Wounds and injuries or compression of nerves; cold and damp; syphilis; lead.

Symptoms.—The onset may be accompanied by febrile reaction. The most decided symptom is pain along the course of the nerve-trunk and its peripheral distribution, of a burning, tingling, tearing, intense character, increased by pressure or motion. If the affected nerve is a mixed one—sensory and motor—spasmodic contractions and muscular cramps occur, followed by impaired motion, terminating in paresis of the muscles innervated by the affected trunk. If the inflammation proceeds to the destruction of the nerve-trunk, wasting and degeneration of the muscular tissue ensue. Various trophic changes also occur, such as cutaneous eruptions and clubbing of the nails. The electrocontractility is impaired or lost.

Diagnosis.—Myalgia or muscular pain is not associated with paralysis, nor does the pain follow the course of a nerve-trunk. In neuralgia there is pain, but, as a rule, no tenderness. In fact, it is relieved by pressure. See NEURALGIA.

Prognosis is generally favorable with proper treatment.

Treatment.—Repeated blistering along the course of the nerve, with full doses of potassium iodid, are usually successful. Sodium salicylate, phenacetin, and antifebrin are each of utility. As the more acute symptoms subside, the use of galvanism or a feeble, slowly interrupted faradic current restores the disordered function of nerve and muscle.

NEURITIS, MULTIPLE. (Polyneuritis, Korsakow's Psychosis, Peripheral Neuritis).—A parenchymatous inflammation of a number of symmetric nerves, simultaneously or in rapid succession; characterized by pain, numbness, loss of power, or ataxia, with muscular atrophy. Mental symptoms are often associated.

Etiology.—Alcoholism; syphilis; malaria; lead, arsenic, or silver; following diphtheria, typhoid fever, and rheumatism. Beri-beri and kakké are epidemic varieties of multiple neuritis and the result of a special poison. See BERI-BERI.

It is likely that the various causes named develop in the blood a poison, having a particular susceptibility or selective action for nerve-fibers.

Symptoms.—The affection is generally bilateral and symmetric. An important characteristic is its peripheral distribution, the inflammation being most intense at the extremities of the nerves, lessening progressively toward the center, usually terminating before the nerve-roots are reached. The inflammatory process affects the nerve-fibers primarily and the sheath and connective tissue secondarily—a parenchymatous inflammation. The affected muscles are paler and smaller than normal, the fibers reduced in size and undergoing granular changes.

All plans suggested for classifying the varieties of multiple neuritis are imperfect. The onset may be sudden, even overwhelming, causing rapid death, but is usually subacute or chronic in its course, the symptoms being wide-spread in proportion to the acuteness, intensity, and cause of the malady. The symptoms may be described under three forms—a motor, a sensory, and an ataxic form.

The motor form shows motor weakness, chiefly involving the flexors of the ankles, the extensors of the toes, and the extensors of the wrist and fingers in the forearms. Inflammation of the anterior tibial or peroneal nerve in the leg, and the radial branch of the musculo-spiral in the arm, results in the double "wrist-drop" and "foot-drop" so characteristic of this disease. Any nerves of the body may be affected, the symptoms varying with the particular nerves.

The sensory form shows pains, tenderness, tingling, and numbness, with loss of cutaneous sensibility.

The ataxic form shows incoordination with or without sensory disturbances, but with loss of the muscular sense.

The forms may all be associated, in greater or less extent, in any one case. Muscular atrophy begins early and progresses with the disease. The knee-jerk is feeble or absent. The electrocontractility is feeble or lost. In alcoholic cases there may be delirium, mania, and delusions, associated with tremors. Trophic changes may occur in the nails, hair, and skin. The characteristic glossy condition of the skin, with some edema, is due to involvement of the vasomotor nerves. Rarely the vagus, optic, and laryngeal nerves are involved. The disease may be ushered in with fever, 101° to 103° F., rapid, feeble pulse, headache, nausea, vomiting, with delirium or confusion.

The alcoholic variety affects chiefly all the limbs; the malarial, the legs; diphtheritic, the pharyngeal and motors of the eye; rheumatic, the face; and lead, the arms.

Diagnosis.—Early diagnosis is most important, as prompt treatment may prevent idleness and months of suffering. Since the symptoms of this wide-spread affection have been properly separated from diseases of the spinal cord, with which they were formerly always associated, the diagnosis is very readily determined. The distinctive features are symmetric localization of the sensory and motor symptoms first and mainly in the extremities, and the tenderness of the skin, nerve-trunks, and muscles. The disease may be confused with rheumatism, neuralgia, tabes dorsalis, poliomyelitis, and other spinal diseases, and hysteric palsy.

Prognosis.—The earlier the treatment is instituted, the better the prognosis. At best, months are required for recovery and even years may be necessary. Involvement of spinal cord precludes total recovery. The return of faradic irritability in nerve and muscle is favorable. To sum up with Gowers: "The prognosis is better in the sensory than in the motor form; better when the arm escapes than when all the limbs are involved; better in cases of chronic than acute onset; and better if a case of apparently acute onset is really such than if it succeeds slight symptoms of longer duration.

Treatment.—The removal of the cause, if possible, is a primary step in treatment. Along with this, rest is most important, and the rest should be complete—in bed. Alcohol should not be allowed, although in cases of great debility its gradual withdrawal may be justified. The patient should, on the other hand, be fed on the most nutritious food. Local anodyne applications may be resorted to to relieve the pain, and may be varied according to effect. Dry heat, moist heat, applications of lead-water and laudanum, and ointments of aconite and veratrin are some of those which may be employed. Wrapping the parts in cotton or wool is sometimes beneficial. Warm baths are soothing; sometimes very hot ones give relief. Postures assumed because of the relief they give to pain should not be too long permitted, lest deformity result by contractions and adhesion difficult or impossible to overcome. Dropping of the feet should be prevented by splints or by the support of sand-bags. The same is true of flexion at the knee and hip.

As to drugs, they are of little use; the salicylates, phenacetin, antifebrin, and antipyrin may be useful in mild cases, and should be tried in doses of 5 to 15 grains. They are more particularly useful in cases due to cold. Extreme pain may demand the cautious use of morphin hypodermically in doses of 1/6 to 1/3 of a grain combined with 1/150 of a grain of atropin, which modifies and improves the action of morphin most happily. For the mental symptoms, the hydrobromid of hyoscin in doses of 1/200 to 1/100 of a grain hypodermically, or hyoscin in doses of 1/400 to 1/150 of a grain may be tried. Mercurials, so highly approved of in simple neuritis, are useless here. The iodids are sometimes beneficial in chronic cases. Roborant medicines, such as iron and cod-liver oil, are indicated to build up the patient, who is generally broken down. Electricity and massage are very useful after convalescence has set in (Tyson).

NEUROMA.—A tumor of or on a nerve. Many a neuroma is really a fibroma. See TUMORS.

NEVUS (or Nævus).—A mark or blemish due to dilatation of the blood-vessels near the surface of the skin or within its texture.

Nævi often grow with marked rapidity, and, though rarely causing fatal hemorrhage, occasion serious inconvenience and great disfigurement. Sometimes they spontaneously disappear, but more often remain stationary. Cystic degeneration or suppuration may occur. Microscopically, a nævus is composed of large capillaries, arterial and venous trunks of larger size, connective tissue, fat, and sometimes sweat- or sebaceous glands. Inflammation of a nævus generally leads to a spontaneous cure. Hence, the injection of carbolic acid is used in the treatment of nævi. But there is danger of an irritating fluid entering a large vessel and passing to the heart, setting up a coagulation causing instant death. Ligation, pressure, application of caustics, such as fuming nitric acid, electrolysis, puncture with the actual cautery, and complete excision of the mass, are also employed in removal. A capillary nævus may quickly be cured by touching it once or twice with fuming nitric acid. A knitting-needle at a dull red heat or the galvanocautery may be employed. Sodium ethylate, in 5 percent solution, applied by a glass rod on 2 or 3 successive days, has been used to destroy the growth. The best plan for the cure of the cavernous variety is excision. Astringent injections are not advised.

Nævus Pigmentosus (Pigmentary Mole).—Circumscribed pigmentary deposit, usually congenital, with or without associated hypertrophy of other cutaneous structures. A "mole" may consist merely of a circumscribed deposit of pigment, or there may be, in addition, hypertrophy of the papillæ, of the hairs, and of the connective tissue. Nævi vary in size from a pea to the palm of the hand or larger, are rough or smooth, elevated or nonelevated, and of a brownish or blackish color.

According to the cutaneous structures involved, various forms of pigmentary nævi are distinguished.

Nævus spilus is a term given to a smooth, flat, pigmented nævus devoid of hair.

Nævus pilosus is a pigmented nævus covered with a growth of downy or stiff hairs.

Nævus verrucosus is a pigmented nævus with an irregular or wart-like surface.

Nævus lipomatodes is an elevated pigmented nævus with connective tissue and fat hypertrophy.

The etiology is obscure. Hairy moles are usually congenital; nonhairy ones acquired. There is increased pigment deposit in the cells of the rete mucosum and also in the corium. In nævus verrucosus the papillæ are greatly hypertrophied. There is often more or less connective-tissue hypertrophy.

Treatment.—The growths may be removed by means of the knife, caustics, or electrolysis. The last named is particularly useful in the treatment of hairy moles.

NEW-BORN INFANT.—As soon as the child is born it should be held by the feet, with the head down, and, with the little finger introduced into the mouth, any foreign material that may obstruct the air-passages should be removed.

As soon as pulsations in the cord cease, it should be ligated with an aseptic ligature, about two fingers' breadth from the abdominal wall. An ordinary surgeon's knot, reinforced by a double bow-knot to permit tightening after the child has had its bath, should be used for this purpose. The cord should now be cut, the free end being allowed to drain into some convenient receptacle.

Asphyxia Neonatorum.—If the child is born asphyxiated, the cord should be ligated and cut immediately, and all mucus extracted from the throat and fauces.

If the case is of minor degree, *stimulation of the reflexes* will be sufficient to establish normal respiration. This is best accomplished by slapping the buttocks and back of the child with the end of a wet towel, by pouring a few drops of ether on its abdomen, or by immersing its back and extremities in warm water and pouring ice-water on its epigastrium. The faradic current, if it can be obtained, is a very powerful stimulant. Inasmuch as shock is a factor of considerable importance in this condition hot saline infusion into the rectum or hypodermics of strychnin (1/200 grain) or brandy (5 to 6 drops) are indicated. In advanced asphyxia artificial respiration should be resorted to immediately. The best methods are *Schultze's* and *mouth-to-mouth insufflation.*

Schultze's Method.—The child is seized by the shoulders from behind with both hands, in such a way that the right index-finger of the operator is in the right axilla of the child from behind forward, and the left index-finger in the left axilla, the thumbs hanging loosely over the clavicles. The other 3 fingers hang diagonally downward along the back of the thorax. The operator stands with his feet apart, and holds the child as described, practically hanging on the index-fingers in the first position, with the feet downward, the whole weight resting on the index-fingers in the axillæ, the head being supported by the ulnar borders of the hands. This is the first inspiratory position. At once the operator swings the child gently forward and upward. When the operator's hands are somewhat above the horizontal the child is moved gently, so that the lower end of the body falls forward toward its head. The body is not flung over, but moved gently until the lower end rests on the chest. In this position the chest and upper end of the abdomen are compressed tightly. The child's thorax rests on the tips of the thumbs of the operator. As a result of this forcible expiration, the fluids usually pour out of the nose and mouth of the infant. The child is allowed to rest in this position (the first expiratory position) about 1 or 2 seconds. The operator gradually lowers his arms, the child's body bends back, and he again holds the infant hanging on his index-fingers with its feet downward; this is the second inspiratory position. The movements are repeated 15 to 20 times in the minute.

Mouth-to-mouth insufflation is performed as follows: Wrap the child in a towel and lay it upon its back on a table or chair, with the head well extended. This is best accomplished by placing a drinking-mug or similar article under the child's neck. Place a piece of clean gauze over its mouth; take a quick inspiration and blow lightly through the gauze. The lungs will immediately become inflated. Secure expiration by compressing the chest and flexing the head. This should be repeated 15 or 20 times to the minute until the child breathes naturally. A very good plan is to alternate the foregoing methods, using one for 3 or 4 minutes and then substituting the other. Efforts at resuscitation should be continued until the child breathes freely or until the heart stops beating.

Other methods are as follows:

Byrd's (H. L.) Method.—The physician's hands are placed under the middle portion of the child's back, with their ulnar borders in contact and at right angles to the spine. With the thumbs extended, the two extremities of the trunk are carried forward by gentle but firm pressure, so that they form an angle of 45 degrees with each other in the diaphragmatic region. Then the angle is reversed by carrying backward the shoulders and the nates.

Laborde's Method.—Rhythmic tractions are made upon the tongue in order to excite the respiratory center. The tongue, covered with gauze, is drawn out by the fingers and allowed to fall back again 15 to 30 times a minute.

Dew's Method.—The infant is grasped in the left hand, allowing the neck to rest between the thumb and forefinger, the head falling far over backward. The upper portion of the back and scapulæ rest in the palm of the hand, the other 3 fingers being inserted in the axilla of the babe's left arm, raising it upward and outward. The right hand grasps the babe's knees, and the lower portion of the body is depressed to favor inspiration. The movement is reversed to favor expiration, the head, shoulders, and chest being brought forward, and the thighs pressed upon the abdomen.

Forest's Method.—The child is placed on its face and quick, violent pressure is made on the back; then it is placed in a pail of hot water, and the hands carried upward until the child is suspended by its arms, and mouth-to-mouth insufflation is practised; the arms are then lowered and the body doubled forward; these movements are repeated at the rate of 40 a minute.

Pacini's Method.—The child lying on its back, the operator stands at its head and grasps the axillæ, pulling the shoulders forward and upward to compress the thorax, and allowing them to fall in order to expand the chest.

Schroeder's Method.—The babe, while in a bath, is supported by the operator on the back, its head, arms, and pelvis being allowed to fall backward; a forceful expiration is then effected by bending up the babe over its belly, thereby compressing the thorax.

Sylvester's method may be used, the head being supported and the feet held firmly by an assistant. See ARTIFICIAL RESPIRATION.

Eyes.—Wash the eyes with clean warm water, and drop on the cornea of each eye one drop of a one or two percent solution of silver nitrate. See CONJUNCTIVITIS (Ophthalmia Neonatorum).

Bathing.—As soon as the third stage of labor is completed and the mother has been made comfortable, the child should be cleansed. It should first be anointed freely with sweet oil to remove the vernix caseosa, and then washed with soap and warm water. The nurse should avoid the eyes during this procedure, since the slightest amount of soap or dirty water coming in contact with them may produce an ophthalmia. Subsequently the child should receive a daily bath. The temperature of the bath should be about 90° F. Appropriate precautions should be made to prevent the child from being chilled when it is removed from the bath.

Cord.—The cord should now be examined closely. If the ligature has become loosened, the bow-knot should be undone, and a firm surgeon's knot substituted. The cut end of the cord should be dusted freely with a powder composed of salicylic acid and starch—1 part of the former to 5 of the latter. It should then be dressed with salicylated or borated absorbent cotton and kept as dry as possible, and the binder applied. At its subsequent daily baths the cord should be closely inspected and fresh powder and dressing applied.

Clothing.—An infant should be clothed as follows: A binder of soft flannel, a diaper, a knit shirt, and knit woolen shoes. Over these should go 2 skirts. These should be suspended from the shoulders. Finally should come its dress. During the winter a knit jacket may be worn over the dress, and, particularly if the child is subject to attacks of coryza, a cap is desirable to protect it from drafts.

The child should have an abundance of diapers, which must be changed from 16 to 24 times daily. To prevent chafing, perfect cleanliness must be maintained and some dusting-powder, like lycopodium or compound talcum, used.

Nursing.—During the first 48 hours the child should be put to the breast regularly every 4 hours. The colostrum that it receives from the breast acts as a mild laxative and secures free evacuation of the meconium in the child's intestinal tract. After the milk appears, it should be put to the breast every 2 hours during the day, and 2 or 3 times at night. This interval should gradually be lengthend until at the end of about the third month it is nursed every 3 hours during the day and once or twice at night. See Infant (Care), Infant Feeding, etc.

NICOTIN.—$C_{10}H_{14}N_2$. A poisonous alkaloid found in the leaves of the tobacco plant; a colorless, oily fluid, of acrid taste and penetrating odor, readily soluble in water, and forming soluble salts with acids. In tetanus and strychnin poisoning the dose is 1/20 to 1/10 minim in 2 hours. The proportion of nicotin in tobacco is about 1:1700. Turkish tobacco contains little or none. It is an open question whether or not there is more nicotin in tobacco before or after curing. Nicotin, even in minute doses (1/7 of a grain), causes symptoms of gastric irritation, with an extreme degree of collapse, abolishing the function of motor nerves and paralyzing respiration. A dose of 1/15 grain has caused death in a human being. For the depression due to excessive smoking, 1 to 2 drams of Hoffmann's anodyne, or the spirit of nitrous ether, is effective. Strychnin is the best physiologic antidote to nicotin.

The treatment of poisoning by nicotin consists in the use of strychnin, the employment of cardiac stimulants, external heat, and atropin, while the stomach should be evacuated, tannin, the iodids, and artificial respiration employed. See Tobacco; and Lambert's Treatment for Narcotic Addiction.

NICTITATION.—Clonic spasm of the orbicularis; and is really frequently repeated involuntary winking. It may be associated with hysteria, chorea, or general neurasthenia; in fact, it may be a symptom of nearly any reflex neurosis. It often becomes a habit. Clonic spasms of the orbicularis sometimes appear after the use of eserin. In persons doing considerable eye-work, there is doubtless some uncorrected error of refraction. The treatment of this condition consists in administering remedies alleviating the nervous condition, or in correcting the ametropia.

NIGHT-BLINDNESS.—See Hemeralopia.

NIGHTMARE.—A feeling of distress or suffocation during sleep, attended by fright, hideous dreams, and often by inability to stimulate muscular contraction, except in the slightest degree. A heavy meal or indigestible food has generally been taken before the sleep, and this is especially so in those of a nervous temperament, whose digestion is weak. Eye-strain sometimes causes night-terrors. A closely allied condition occurs as a consequence of brain-exhaustion, and in those whose sleep has continually been broken in consequence of overwork, by application to study, business details, or literary pursuits. Certain forms of incipient delirium are akin to it, such as occur in various febrile diseases or as a result of alcoholic excesses.

Treatment.—The diet should be light, and late meals and indigestible food avoided. A teaspoonful of camphor water, repeated if necessary, may be the best remedy. For the nightmare of adults potassium bromid in small doses may be administered. In the attacks of night-screaming of children the digestive organs are frequently at fault, although they are sometimes associated with worms and delayed dentition. The moral surroundings of children so affected should be closely studied. Ghost stories and appalling tales should be discontinued. Indigestion is to be treated by a few grains of sodium bicarbonate and powdered rhubarb. Forbidding potatoes, candies, puddings, fruit, and cake may have a salutary effect. Potassium, sodium, and ammonium bromids are probably the best means of preventing future attacks. Sulphonal, chloral, or trional may also be given. Punishment, cold douches, or treatment adding to the distress are to be condemned. During the attack, efforts should be made to soothe the child and calm its fears by assurances of present safety.

The following mixture may be given every night at bedtime to a child of 1 year:

℞. Ammonium bromid, Sodium bromid, Wine of antimony,	each, ʒ ss
Simple syrup,	℥ j
Peppermint water, enough for	℥ ij.

Give a teaspoonful at bedtime.

NIGHT-SWEATS.—The profuse nocturnal sweating often observed in pulmonary tuberculosis and other wasting disorders. In tuberculosis of the lung they are one of the most distressing features, and may come on early in the disease, although they are more persistent and frequent after cavities have formed.

Treatment.—Belladonna, or its alkaloid, atropin, is one of the best remedies. It may be given internally, or externally as a liniment. It is especially beneficial when applied externally to children. Atropin, 1/200 to 1/100 grain hypodermically, or 1/60 to 1/20 grain by the mouth, is useful when given about 1 hour before the usual or expected time of beginning of sweating; duboisin may be used instead. Aromatic sulphuric acid may be used alone, or with belladonna or morphin, to check night-sweats, but it creates indigestion. Camphoric acid, given dry on the tongue, not over 2 hours before the expected sweating, is considered one of the very best remedies against sweating from various causes, but especially that from phthisis when it is very profuse. The dose is 10 to 30 grains. Pilocarpin, 1/20 grain hypodermically, or given in the same dose thrice daily by the mouth, may be used to check profuse perspiration, even when atropin fails. Dover's powder will often check a profuse colliquative sweating. Agaricin, muscarin, and zinc oxid at bedtime are useful for the night-sweats of phthisis.

℞.	Zinc oxid,	gr. xxx
	Extract of belladonna,	gr. iij.

Make into 10 pills. Give 1 pill before going to bed.

Tannic and gallic acids, salicin, and ergot are all employed.

Acetic acid, diluted one-half with water, alum dissolved in weak alcohol, and naphthol in a 5 percent alcoholic solution are used locally Oleate of zinc and of aluminum may also be used. See TUBERCULOSIS.

NIPPLE.—See BREAST (Diseases).

NITER.—See ETHER, NITRATES.

NITRATES.—The salts of nitric acid. All nitrates are soluble in water. A solution called acid phenylsulphate, and composed of 46 1/2 grains of phenol in 5 1/2 drams of strong sulphuric acid, is used for the detection of nitrates in water. See WATER.

Potassium nitrate, or saltpeter, sodium nitrate, and silver nitrate are the most commonly used nitrates in medicine. These and the other nitrates are described under the metallic titles. They are poisonous, and are often taken with suicidal intent. Emetics and the stomach-tube should be used, and soap in quantity administered. Demulcent drinks should follow, and emollient enemata used to protect the lining membranes of the intestines. Milk may be used with benefit. Of antagonists, opium in small doses may be administered for the subsequent depression, and aromatics and brandy are of value.

NITRIC ACID.—A colorless, fuming liquid, very caustic and corrosive, of strong acid reaction, used only externally as a caustic. Its preparations are: **Diluted Nitric Acid,** 10 percent nitric acid, given in the dose of 3 to 40 minims, well diluted. **Nitrohydrochloric Acid** or **Nitromuriatic Acid** (aqua regia), a golden-yellow, fuming, corrosive liquid, having 18 volumes of nitric acid and 82 volumes of hydrochloric acid, a drop of which, added to a test-solution of potassium iodid, will liberate iodin in abundance. Dose, 1 to 8 minims, well diluted. **Diluted Nitrohydrochloric Acid.** Consists of nitric acid 4, hydrochloric acid 18, water 78. Dose, 5 to 20 minims, well diluted.

Therapeutics.—Nitric acid does not tend to relax the bowels, as does nitrohydrochloric acid. It coagulates, but does not redissolve, the albumin of the tissues, and thus soon makes a barrier for itself. It is used externally to destroy warts, chancres, hemorrhoids, phagedenic ulcers, in gangrene, etc. For indolent ulcers a solution of from 5 to 30 drops to the ounce is of use. In oxaluria nitric acid is preferable to the nitromuriatic acid. Three-drop doses of nitric acid are beneficial when small ulcers in the mouth or stomatitis exist. In gastric indigestion, intestinal dyspepsia, the green summer diarrhea of children, and combined with pepsin in the chronic diarrhea of children, it is stimulant and astringent. A lotion of nitric acid, 1/2 to 1 dram to a pint of water, is of service in bleeding hemorrhoids. The dilute acid should be taken through a glass tube to protect the teeth.

In cholera morbus:

℞.	Nitric acid,	ʒj
	Tincture of opium,	gtt. xl
	Camphor water,	℥viij.

Give one-fourth part every 3 or 4 hours.

Nitrohydrochloric acid is an efficient cholagog, and is employed with benefit in jaundice, dyspepsia, the so-called bilious condition, and also in acidity of the stomach. The official dilute acid rapidly deteriorates, and the strong acid also is unstable. It is best to use only the strong acid freshly prepared, which is of an orange-red color. This should be constantly protected from light and taken well diluted.

NITRITES.—The salts of nitrous acid, HNO_2. The term is also applied to certain combinations with organic radicles, as nitroglycerin, $C_3H_5(NO_2)_3$, nitrobenzol, amyl nitrite, and other compounds.

Physiologic Action.—Amyl nitrite and the other nitrites agree closely in their general action, producing great vascular dilatation by paralyzing the sympathetic system, the vasomotor center, or the muscular coat of the arterioles—which, is yet undecided. They cause tumultuous action of the heart by relaxing its inhibition; lowered respiration, from paralysis of the respiratory muscles and impairment of the ozonizing function of the blood; diminution of sensation, motility, and reflexes; a sense of heat, but lowered body-temperature; also throbbing pain in the head, beating carotids, quickened pulse, flushed face, and vertigo. Sodium nitrite is slower in action than amyl nitrite, and does not cause so much throbbing headache as nitroglycerin. It may be given in solution with water. The action of all these agents is probably due to the nitrous acid contained in them. Nitroglycerin acts similarly to the nitrites, but less promptly, and its action is more enduring. The headache it produces is of intensely frontal character, and persists for hours after the other effects have passed off. It is more suitable than amyl nitrite for internal administration.

Therapeutics.—**Amyl nitrite** possesses a peculiar fruity odor. It is useful in attacks of angina pectoris, asthma, epileptiform convulsions, transient hemianopsia, and occasionally in sea sickness. Dose, internally, 1/4 to 1 minim, dissolved in alcohol; by inhalation 2 to 5 minims, generally put up in glass beads.

Nitroglycerin is sometimes of benefit in neuralgic dysmenorrhea and in sea-sickness; in chronic interstitial nephritis; and in hiccup and migraine of spasmodic character, and has given immediate relief in neuralgia of the fifth nerve and in sciatica. In angina pectoris it gives more lasting effects than amyl nitrite. In the weak heart of the aged, or in that from fatty degeneration, or when, as in Bright's disease, arterial tension is above the normal, and in irritable and overacting heart, it is of service. It is a dangerous explosive, and should not be kept in stronger solution than 1 percent. Dose, 1/200 to 1/50 minim or more, according to susceptibility.

Sodium nitrite may be used in hemicrania, angina pectoris, and in asthma of purely bronchial and neurotic origin. In chronic desquamative nephritis, with a weak and dilated heart, it is useful. By prescribing it with spirit of chloroform or ammonia water, and small doses of morphin, disagreeable symptoms may be avoided. Dose, 1/2 to 3 grains.

Poisoning.—Ergot, belladonna, strychnin, brucin, digitalis, picrotoxin, and all other agents which increase the functional activity of the spinal cord and sympathetic, are antagonistic, though by reason of their slower rate of diffusion the antagonism may not always be available. Stimulants, artificial respiration, the alternate cold and hot douche, with cold to the head, and ergotin or atropin subcutaneously, are the best means to be used in cases of poisoning by the nitrites.

NITROGLYCERIN.—See NITRITES.

NITROUS ETHER.—See ETHER.

NITROUS OXID.—N_2O. Nitrogen Monoxide. A gaseous compound known also as laughing gas, devoid of odor, but with a slightly sweetish taste, which, when inhaled, produces mental exaltation and cerebral excitement, followed by anesthesia. It is the safest of all anesthetics, but ought not to be given to those far advanced in age or having atheromatous arteries. It rarely produces any disagreeable after-effects, save a slight dizziness for a few hours. It is much used in dentistry. Its preparation requires apparatus too cumbersome for the ordinary practitioner of medicine. When first inhaled, the face becomes flushed, then of deadly pallor, and the lower jaw may drop; at this time anesthesia is complete, and the operation should be quickly performed. The gas should be administered without access of air, and if so, insensibility is usually attained in from 50 to 80 seconds from the commencement of inhalation. The following points are to be studied in the administration of nitrous oxid as an anesthetic:

1. The patient should have a full and free expansion of the chest. To obtain this all impediments to free chest movement should be removed. The head should not be thrown back nor flexed in any direction, and the feet should be so placed that if violently extended, they cannot come in contact with a wall or other fixed point of resistance. Two hours after a moderate meal is not too soon for administration. It may be reinspired with safety, when necessary.

2. The apparatus employed should be of modern description, and in good working order. Nitrous oxid is supplied in a liquid form, condensed by its manufacturers into wrought-iron bottles, whence it is liberated into bags from which it is to be inhaled. The bag should not be filled within the patient's sight, never overfilled, and should rest in the patient's lap during inhalation. The bottles should be small, duplex, and should both be connected with the air-bag, so that one may be drawn from if the other is exhausted, without delay. The screw-plugs in bottles should be turned loose, and away from the operator or surrounding persons. The mask may be of celluloid, and its rubber pad should be inflated immediately before use.

3. During administration the mask should fit so closely as to allow no admission of air. If it is wished to prolong unconsciousness, the mask should be lifted up after 6 or 8 full breaths of gas have been taken, or signs of anesthetization are apparent, so that air may be once more inhaled, and more gas then administered, etc.

4. During, and immediately after, operation care is to be exercised against a vigorous inspiratory effort drawing materials—blood-clots, portions of extracted teeth, or other substances—into the larynx. The mouth is to be washed out while the head is turned to one side.

5. If possible, a qualified assistant should be on hand to administer the gas, and to guard against complications from the possible occurrence of erotic delusions in female patients.

For description of nitrous oxid and oxygen anesthesia in major surgery, see ANESTHETICS (General).

NOCTURNAL EMISSIONS.—Too frequent emissions reduce the strength, make the patient irritable and weak, and gradually prey upon his mind. When masturbation is practised, extreme mental depression ensues. Nocturnal emissions occurring in normal males who are continent and chaste are not to be interfered with unless excessive.

Treatment.—Unchaste literature and lascivious thoughts are to be avoided. A hard mattress and light covering is advisable. Sleeping on the back is undesirable. A spool is sometimes tied around the loins so that when the sleeper rolls on his back, he is awakened by the pressure. Of drugs used to prevent the nocturnal emissions, potassium bromid, in doses of 20 grains at bedtime, or the same amount of chloral, may be taken. Hyoscin hydrobromid, 1/100 grain, has been recommended. Cold sponging of the perineum and loins night and morning has been of great benefit. All irritations of the bladder or genitourinary system should be corrected. Potassium citrate, in doses of 20 grains in water 3 times daily, will render the urine unirritating and alkaline, and allay a provocative cause of emissions. Arsenic alone or in combination with strychnin is often of service when given in full dose. Stimulating foods and drinks are to be avoided.

NOCTURNAL ENURESIS.—See Urine (Incontinence).

NOMA.—See Stomatitis (Gangrenous).

NOGUCHI'S TEST.—See Syphilis.

NOSE-BLEED.—See Epistaxis.

NOSE, CARIES AND NECROSIS.—Inflammation of the bones of the nose, leading to caries and necrosis, is usually the result of syphilis, hereditary or acquired; but it may be due to tubercle or glanders, to injury, the presence of foreign bodies, septic decomposition, mercury, and occasionally the fumes of bichromate of potassium. The septum may be attacked, so that the bridge of the nose sinks in (although, in an adult, a great deal may be lost without any apparent alteration in shape), or the turbinate bones, or the roof, and in the latter case there is always the risk of meningitis.

The symptoms are those of inflammation of the mucous membrane, but the discharge is always profuse and fetid, the breath exceedingly foul, and nothing, so long as any dead bone exists, gives more than temporary relief. In many cases the diagnosis is clear at once; either there is a perforation of the hard plate, or a probe introduced into the nasal cavity strikes the sequestrum at once; but sometimes, especially when it lies toward the upper and back part, detection is a matter of very great difficulty.

Treatment.—The dead bone must be removed as soon as it is loose, careful attention being paid at the same time to any constitutional taint that is present. In most cases it can be extracted, under an anesthetic, through the anterior nares; sometimes it is easier to push it back into the pharynx (the two forefingers can usually be made to meet in the inferior meatus of the nose, the one introduced from the front, the other from behind, when the patient is anesthetized), but the operator must be prepared for free, though not usually serious, hemorrhage. When, owing to the size of the fragment, this cannot be done, Rouge's operation may be performed—*i. e.*, an incision made through the mucous membrane, where it is reflected from the under surface of the upper lip on to the gum, the cartilaginous septum detached from the anterior nasal spine, and, if necessary, from the maxillary crest; the alæ detached at the margins, and the upper lip with the nose lifted up and reflected on to the forehead. The nasal cavities are thoroughly opened up to view by this, the whole interior can be examined, and then the nose and lip replaced without a suture being required or a mark left. If the dead bone, without being loose, is fairly accessible, as frequently happens in hereditary syphilis, it may be partially dissolved away by a sulphurous acid spray (which also helps to check the fetor), and occasionally can be chipped off in little pieces with a fine chisel, but care must be taken that the instrument does not slip and penetrate the roof. See Rhinitis (Chronic).

NOSE, CATARRH.—See Rhinitis.

NOSE, DEFORMITIES.—Congenital malformations are rare; deformities, on the other hand, resulting from injury, lupus, or syphilis, are very common.

Deviations of the septum, if causing severe symptoms, may be straightened by means of forceps or operation, but the tendency to return is often so great that either the process must be repeated again and again, or an intranasal splint must be worn for some time.

Extensive destruction of the soft parts can sometimes be remedied by means of a plastic operation; but in cases in which it is due to disease, this should never be attempted until the stump is perfectly sound.

The two best known methods of **rhinoplasty** are the Indian, and that first carried out by Tagliacozzi (the Italian). In the former a flap of suitable shape is marked out upon the forehead, having its pedicle immediately over the root of the nose, or slightly to one side, so that it can be twisted down more easily. This is carefully dissected up [Langenbeck recommends that the periosteum should be brought away with it], adjusted in a bed prepared for it by cutting away the old scar-tissue around the margins of the orifice, and secured with sutures, hollow plugs being inserted into the nostril, so that it may retain its shape. To avoid the sinking inward of the tip, Lagenbeck reflected some of the bony margin of the nostril, fashioning a flap from each side, so that they should meet like the rafters of a roof in the middle; but when the nose has been destroyed by inflammation, this proceeding is rarely practicable. In the Italian method the skin is taken from the arm over the biceps. In the original plan the flap was raised by an incision down each side and left to granulate; then the upper end was separated; and, after the skin, detached now on 3 sides, had begun to shrink, it was carefully fixed by sutures in the freshly cut margins of the defect. The arm is fixed with plaster bandages in a suitable position, and must be so retained without the slightest traction for at least 8 days. The treatment has since been shortened by detaching the flap at an earlier date, but naturally with some risk. Of these two methods there is no doubt that the former is the better when it is practicable, in spite of the scar it leaves. In the latter the transplanted flap sinks into a shapeless mass. Neither, however, is really satisfactory, and it is probable that in most cases the deformity would be better concealed by an artificial nose made from vulcanite or enameled silver and fastened on to the spectacle-frame.

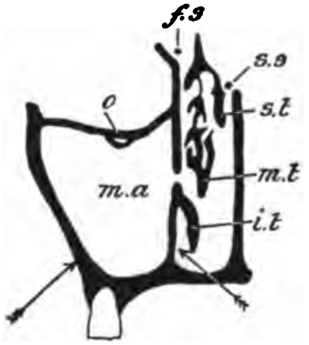
In cases in which one ala only is defective, Langenbeck's plan of reflecting a flap from the other on the opposite side (leaving it attached by a bridge upon the dorsum) tends to diminish, or at least equalize, the deformity. There is, however, some difficulty in separating the skin from the cartilage without cutting or bruising it, owing to the very close connection that exists between the two. See Plastic Surgery.

NOSE, DISEASE OF THE ACCESSORY SINUSES.

Empyema of the Maxillary Antrum.

This sinus is an air space in the upper jaw lined with thin mucous membrane and communicating with the middle meatus of the nose by an opening about one inch above its floor. Into the floor project the roots of the molar teeth, which are separated by only a very thin plate of bone; but the roots of any of the teeth in the upper jaw may communicate with it.

Empyema of the antrum is a collection of mucopus prevented from escaping into the nose owing to the orifice being obstructed, or owing to the fact that it is above the level of the floor. The empyema may form in course of an acute inflammation, especially during influenza, or may occur as a subacute affection by extension from a dental alveolus, and less commonly from necrosis of bone; or it may be a mere chronic retention, owing to the orifice being blocked by nasal polypi. An empyema may rarely be the result of an acute osteomyelitis of the walls of the maxillary antrum, set up by septic inflammation in the mouth, such as cancrum oris, or it may follow gonorrheal conjunctivitis.



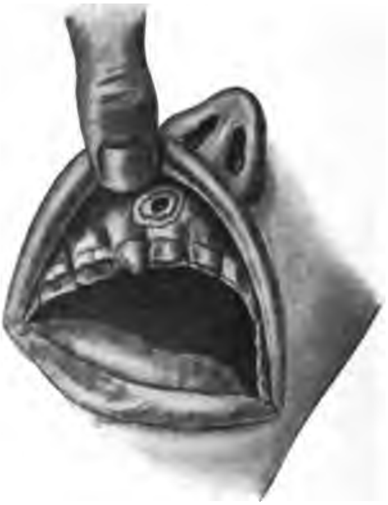
The Maxillary Antrum.

i.t, *m.t*, *s.t*. Inferior, middle and superior turbinals. *m.a*, Maxillary antrum opening into middle turbinal fossa. *f.s*, Frontal sinus and infundibulum, into which open anterior ethmoidal cells. *s.s*, Orifice of sphenoidal sinus. *o*, Infraorbital canal. Arrows show the points at which the antrum is punctured.—(*Spencer and Gask.*)

The signs are neuralgic pain and inflammatory swelling of the cheek, with fever. Pus may escape from the nose, pale yellow, intermittent in its flow, and its odor will then be perceived, especially by the patient; whereas in atrophic ozena the patient may be unconscious of the foul odor, so evident to bystanders. It flows when the patient's head is bent forward, or may be directed backward into the pharynx and disturb the patient's appetite. The interior of the nose should be wiped free of pus, and the patient's head bent, after which the meatus will be again full. When it does not escape the signs of tension are more marked.

Transillumination of the upper jaw serves to confirm this. The patient is seated in a dark room, or is examined under a photographer's cloth, supported by an umbrella. A small electric lamp is placed in the mouth and the lips closed, when a dull glare will illuminate the sound cheek and pupil, leaving the pupil on the diseased side and the infraorbital region partly in shadow. With eyes closed the patient experiences a dull red glow in the eye of the sound side, which is absent on the diseased side. It is this unequal illumination of the two sides which is important for diagnosis.

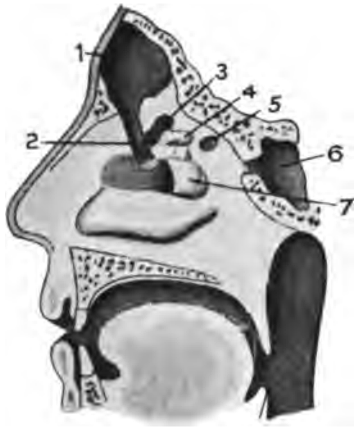
If neglected, the empyema may burst on the cheek or lead to necrosis of the upper jaw, or there may be septic absorption resulting in pyemia; or septic thrombosis of the orbital veins may occur, producing proptosis or acute optic neuritis; or the thrombosis may extend further back to the cavernous sinus and brain, setting up meningitis.



Puncture of the Maxillary Antrum through the Canine Fossa.—(*Spencer and Gask.*)

Treatment.—Cocain is applied to the inferior meatus and then a trocar and cannula is pushed through the wall into the antrum. If pus escapes the cannula can be kept in or it is replaced by a tube and the antrum frequently irrigated. Or the hole may be enlarged under gas at the same time that the anterior end of the inferior turbinal is removed. This provides an opening level with the floor of the antrum which shows no tendency to close, and through which the antrum can be easily irrigated by passing a catheter like a eustachian, or female urethral catheter. If there are polypi to be removed from the antrum, the aperture as above is further enlarged by raising the lip from the gum so as to expose the lateral nasal wall of the superior maxilla which is chipped away until a finger and a sharp spoon can be inserted. Polypi and dead bone are scraped away, but healthy mucous membrane is left. After this a plug of iodoform gauze is inserted and brought out through the nostril, while the communication with the mouth is closed by suture. Blood is prevented from running back by temporarily plugging the posterior nares before cutting away the turbinal.

If the disease is dental in origin the antrum may be perforated through the canine fossa, and a counter-opening made into the inferior meatus of the nose as above; for then the communication with the mouth will soon close spontaneously. Dental surgeons, instead of making the counter-opening, pass a short cannula through the perforated socket of an extracted tooth, the lower end of the cannula being fixed in a dental plate and closed by a split plug with a knob to facilitate withdrawal. This is retained until the mucous membrane of the antrum has returned to the normal. But the objection is that dead bone, polypi, or food materials from the mouth may keep up the discharge indefinitely.



Sinuses Opening into the Upper Part of the Nose

1. Frontal sinus. 2. Infundibulum. 3. Opening of anterior ethmoidal cells. 4. Superior turbinal. 5. Opening of posterior ethmoidal cells. 6. Sphenoidal sinus. 7. Middle turbinal partly cut away. (*Spencer and Gask.*)

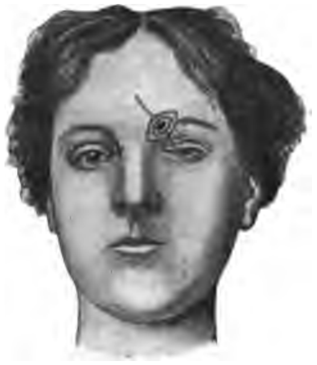
Mucocele and Empyema of the Frontal Sinuses. Mucocele.—Retention of mucus may occur in the frontal sinus owing to swelling and hypertrophy of the nasal mucous membrane over the middle turbinal, or to the formation or polypi in that region. The anterior wall of the sinus after a time becomes thinned and a fluctuating swelling forms on the forehead to one or both sides of the middle line. An acute inflammation of the nasal mucous membrane, such as may be set up by influenza, may spread up the infundibulum to the frontal sinuses, giving rise to an *empyema* with or without an intermittent discharge of pus into the nose.

The **symptoms** are frontal headache, and when there is suppuration, severe frontal pain, also redness and edema of the forehead and eyelids, and later fluctuation and pointing. With this is a continuous discharge of pus through the infundibulum, or the passage of a probe into the infundibulum may push aside polypoid granulations, and be followed by a flow of pus.

An X-ray examination shows the size of the frontal sinus, which varies from a small dilatation of the upper end of the infundibulum to one extending upward on the forehead and outward to the outer angle of the orbit, the sinus of the two sides freely communicating.

Treatment.—*A mucocele* may be relieved by excising the anterior end of the middle turbinal bone and also any polypi, then the frontal sinus is washed out by passing a cannula.

An *empyema*, when the mucous membrane is still healthy, may be relieved in the same way. If it is of some standing and there is a polypoid degeneration of the mucous lining, an incision is required. This is an angular one about 1 1/2 inches in length, through the inner margin of the eyebrow down to the bone. The periosteum along with the pulley of the superior oblique muscle is pushed toward the orbit. Then the floor of the frontal sinus is entered at its lowest level through the roof of the orbit just behind the inner angle. The whole sinus is scraped out including the infundibulum, and a free communication with the nose reestablished. A rubber tube is now cut off the length to reach from the upper end of the infundibulum to the free margin of the anterior nares. To hold it in place a temporary suture is inserted at each end of the tube. This enables the skin wound to be entirely closed, and so a fistula and puckered scar is avoided.



Frontal Sinus Operation.

On the right side is shown the line of the incision; on the left side, the opening made into the sinus. (*Spencer and Gask.*)

In the case of a very large frontal sinus some of the anterior and inferior wall must be clipped away, and then an iodoform plug is required to stop the hemorrhage, after the removal of which a secondary suturing of the skin can be done.

Disease of the Ethmoidal and Sphenoidal Sinuses.—The ethmoidal sinuses lie along the inner wall of the orbit, and a mucocele produces a swelling on the inner side of the orbit, which pushes the eye outward and causes squint.

The sphenoidal sinus lies behind in the base of the skull. The orifice of the sphenoidal sinus can be reached by first applying cocain, then passing a probe backward and upward across the center of the middle turbinal, while the shank of the probe is kept in contact with the lower margin of the anterior nares.

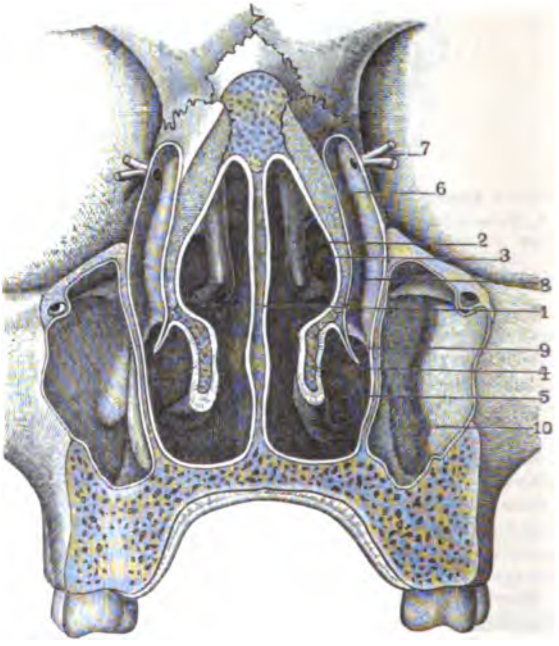
Ethmoidal and sphenoidal empyemas give rise to deep-seated pain in the orbit and back of the nose, with a discharge into the nasopharnx. The dangerous complications are septic basal meningitis and thrombosis of the cavernous sinus. Exophthalmos, ptosis, strabismus, retrobulbar neuritis, and blindness occur when the nerves at the back of the orbit become involved. **Treatment.**—Removal of the anterior end of the middle turbinal may relieve simple retention. The ethmoidal cells may be curetted from the nose, regard being had to the nearness of the meninges and cavernous sinus. The anterior ethmoidal cells are reached through the inner side of the orbit, by extending the incision for the frontal sinus a little downward. The sphenoidal sinus opening is enlarged under the guidance of the probe passed as above. A general anesthetic may be given, a speculum inserted, and a fine cutting hook is passed in and the orifice enlarged, or fine punch forceps may be employed for the purpose. (Spencer and Gask.)

NOSE, EXAMINATION.—This organ consists of two parts: the external, made up of skin, cartilage, and bone; and the internal, or nasal fossæ, which communicate with the pharynx posteriorly through the medium of the posterior nares. The anterior nares form the entrance to the nostrils. Each nostril contains 3 turbinated bones—the superior, middle, and inferior—thus dividing it into the superior, middle and inferior meatuses. The whole of the internal surface is covered with mucous membrane, that on the turbinated bodies being easily congested and highly erectile. The portion covering the lower and anterior portions of the middle and inferior turbinated bodies frequently gives rise to catarrhal inflammation with obstruction of the nasal chamber. Thick, viscid mucus is constantly secreted from muciparous and serous glands lining the internal surface of the nostrils, which catches foreign particles that have been inhaled and also warms the air before it reaches the lungs. The nasal cavities (choanæ) communicate with the ethmoid, frontal, and sphenoid sinuses and the antrum of Highmore, all of which are lined by a prolongation of the nasal mucous membrane. The superior portion of each nasal chamber is supplied by filaments from the olfactory nerve and controls the sense of smell, while that portion below the lower border of the middle turbinated bone may be termed the respiratory portion.

Anterior Rhinoscopy.—The essentials are: A good light, a nasal speculum, a nasal probe, and a head-mirror with a central opening.

The patient should be seated facing the examiner, and with the light behind or on each side of head, and on a level with the eye of the operator. After anesthetizing the anterior nares with a few drops of a 10 percent solution of cocain, the nasal speculum is introduced, and at the same time the light is reflected into the nares by means of the head-mirror. It is essential for the examiner to always look through the central opening of the head-mirror rather than from above or below. It is best to examine the nares anteriorly, gradually going backward until the whole anterior chamber has been surveyed. A hypertrophic condition can be quickly determined by applying a few drops of a solution of cocain (10 percent) to a suspected spot by means of a pledget of cotton wrapped around the probe, when, if no organic change has taken place, the erectile tissue quickly contracts and the enlargement disappears. Care should be exercised at all times against cocain poisoning.

Posterior Rhinoscopy.—For this are needed a tongue-depressor, head-reflector, throat-mirror, palate-hook, and throat-applicator. The patient should be seated in the same position as for anterior rhinoscopy. A few drops of a solution of cocain (5 percent) are then applied to the upper and posterior vault of the pharynx and the palatine folds (care being exercised to prevent swallowing the fluid), and, after waiting a minute or two, the tongue-depressor is inserted in the mouth to a sufficient distance to hold the organ down, but not sufficiently to cause gagging. The light is then directed toward the pharynx, and the mirror, after being slightly heated (to prevent it becoming



Transverse Section of Nasal Fossæ.

1. Nasal septum. 2. Anterior extremity of middle turbinated bone. 3. Middle meatus. 4. Section of inferior turbinated bone. 5. Inferior meatus. 6. Lacrimal canal. 7. Canaliculi. 8. Nasal canal. 9. Section of reflected mucous membrane. 10. Maxillary sinus or antrum of Highmore.

cloudy from the moisture during respiration), is introduced well back into the pharynx, and, by rotating it slightly, the choanæ are surveyed thoroughly. Subsequently the lower portions of the posterior nares are examined. Directions should be given to the patient to breathe naturally during the examination, otherwise the soft palate retracts and closes the posterior orifices. In some cases the tongue-depressor causes gagging, and in these cases the organ may be held out of the way by grasping it within the folds of a napkin. The examination is often an educative one on the part of the patient, and the first trial may fail.

NOSE, FOREIGN BODIES.—Peas, beads, pebbles, beans, marbles, and the like are sometimes pushed up the nose by children, and sooner or later lead to inflammation and nasal discharge. Foreign bodies may enter the nose from vomiting. Insects may fly or crawl into the nose.

In cases in which it is difficult to grasp the foreign body with a small blunt hook, scoop, or properly curved forceps, or to push it back into the pharynx, the following device may be employed: A small sized Nélaton catheter, to the distal end of which a long silk ligature is attached, is carefully and slowly passed into the nares until it reaches the pharynx; the gagging induced forces the catheter out of the mouth; it is then seized and the ligature pulled through, about 8 inches being allowed to remain outside of the nose. A small wad of absorbent cotton fastened to the buccal end is slowly drawn upward into the posterior nares and along the inferior meatus. The foreign body, particularly if it is a tack or an object with jagged edges, is generally caught and dragged out of the anterior nares with the cotton.

The appearance of the nasal mucous membrane after the removal of the offending body is apparently one of severe ulceration. Under simple instillation of lukewarm salt-water (0.75 percent), or weak boric acid solution, the parts readily and quickly assume their normal appearance.

NOSE, FRACTURE.—The nasal bones often suffer from direct violence; the fracture may be compound, either externally or internally, or both, or it may be comminuted, and the injury may be limited to the bones themselves, or the septum may be bent or crushed in, or the other bones that surround the nasal cavities may be involved as well. Hemorrhage is always profuse; emphysema is occasionally present from the escape of air into the tissues, and deformity and swelling are generally very considerable.

Treatment.—No pains should be spared to effect reduction as early as possible. Manipulation is exceedingly painful, so that, if the displacement is at all extensive, it is advisable to give an anesthetic. The bleeding, which is sure to be profuse, must be checked afterward by injecting ice-cold water, or by the application of an ice-bag. Elevation from within with a steel director, or a pair of dressing-forceps, may be tried first, but they are not of much service in really bad cases. In some instances it is necessary to grasp the fragments with smooth-bladed forceps, bent so as not to pinch the soft tissues near the nostril, and twist them into position. Later on a great deal may be done to correct any deformity that is left by means of pressure. A spring truss may be used, especially at night, outside the face, or, as Erichsen suggests, india-rubber bags may be introduced into the nostril and inflated. Spectacle- or eye-glass splints have also been used with success. Suppuration is not uncommon, but it is rarely serious; ozena and necrosis, however, occasionally occur, and when the fracture extends on to the face so as to involve the nasal process of the superior maxilla, stricture of the lacrimal duct generally follows.

NOSE, POLYPS.—Polyps of the nasal passages form soft, gelatinous, semitranslucent masses, pale pink or yellow in color, projecting from the surface of the mucous membrane, and sometimes reaching far into the anterior and posterior nares. At first they are small and sessile, and in any advanced case numbers in this stage can be seen between the larger ones. Those that project toward the front may usually be seen at once (or if the patient expires forcibly) forming smooth, pedunculated masses very soft to the touch, and moving up and down with each breath. The deeper ones may require a speculum, and those that grow into the posterior nares can only be detected by introducing the finger round the margin of the soft palate. Occasionally, when one has been exposed to the air for any time, the surface becomes dry and rough, and then it may possibly be mistaken for an overgrowth of the mucous membrane over the inferior turbinated bone; otherwise it is difficult to see how such an error can arise.

Symptoms.—Chronic catarrh is always present. The breathing is obstructed (especially in wet weather, when the polyp swells up); the mouth is held open; the voice is altered and becomes muffled; the sense of smell, and often that of hearing, is lost; and nearly always there is constant frontal headache. In severe cases the shape of the nose may become altered by the internal pressure; the lacrimal duct obstructed; the septum displaced to one side; and the eustachian tube occluded. As a rule, there are no bleeding and no offensive discharge, both of which symptoms are common in the case of malignant growths.

Treatment.—There are various ways of removing polyps. The simplest is to grasp the neck as high up as possible with a pair of slightly curved forceps, having long serrated blades, and twist it round and round until it comes away. If there is a very distinct pedicle, the ordinary wire écraseur may be employed, or the galvanocautery, cocain being used to allay the pain and prevent sneezing. Polyps that lie far back, in or near the posterior nares, can only be snared if the forefinger of the other hand is carried around the back of the soft palate to guide the loop. The bleeding is free, but ceases at once upon the application of ice-cold water. The chief difficulty is to make the removal thorough; and the operator should not be satisfied until the passage between the two nares is completely freed. Even then many small growths must be left behind, and these, released from the pressure of the larger ones and stimulated by the inflammation that follows the operation, are almost sure to spring up rapidly. To prevent this, tannic acid or sulphate of zinc may be used as snuff, or the cavity may be washed out with boric acid and alcohol, or with other astringents; but constant care is needed. In the worst cases it may be necessary to perform Rouge's operation.

After removal, true polyps return rapidly, hence it is necessary to have the case under observation; the base of each polyp should be cauterized with trichloracetic acid or the galvanocautery. Should a young polyp be detected, it should be removed at once, and its base treated accordingly. The nasal passages should be kept cleansed with some simple collunarium, such as chlorate of potassium and bicarbonate of sodium in water at 95° F., followed by a spray of some bland protective, such as albolin or vaselin, to the cauterized surfaces and mucous membrane. This local treatment should be conjoined with such drugs as will improve the constitutional condition of the patient, as arsenic, syrup of the iodid of iron, or the hypophosphites. See Adenoid Vegetations.

NOSTALGIA (Home-sickness).—An abnormally exaggerated longing for home, relatives, or friends. It is most frequent among the Swiss mountaineers and other persons who have always led an isolated life, and have been more or less dependent upon a small circle of relatives and friends for companionship and diversion. Nostalgia represents a combination of psychic and bodily disturbances, and must be defined as a disease, and may become the object of medical treatment. It is most troublesome when it occurs in new military recruits, and may lead to melancholia and even death. Often the only cure is to allow a return home. Nostalgia must not be confounded with disappointment or moroseness produced by illness, bad temper, or discontent with the temporary position abroad. Compulsory absence from home has great influence in causing nostalgia, and in these cases there is more liability to nostalgia than in those in which the patients are at liberty to go where they please.

NOVARGAN.—Silver proteinate. An organic silver-albumin compound containing 10 percent of silver. As a bactericide, it is claimed to be more effective and less irritating than other protein-silver compounds. In the form of a 15 percent solution it is said to be useful for the treatment of gonorrhea, especially as an abortive in the first stage.

NOVASPIRIN.—Methylene-citrylsalicylic acid. It is decomposed in the intestines into methylene-citric acid and salicylic acid after passing through the stomach unchanged. Its diaphoretic action is slight, and it is said to be devoid of unpleasant effects. It is recommended in influenza, neuralgia, gouty and rheumatic conditions. Dose, 8 to 15 grains.

NOVOCAIN.—A local anesthetic similar to cocain. It is recommended as a substitute for the latter and is claimed to be far less toxic than any of the cocain substitutes.

NUCLEIN.—Nuclein is that constituent of the cell by virtue of which it grows, develops, and reproduces itself. It is the chemic basis of the nucleus. Nuclein is contained in the cellular envelope of the tubercle bacillus, and it is the nuclein which takes the stain. It has been obtained from the thymus and thyroid glands, spleen, testicle, white of egg, and from brewers' yeast. It is abundant in the polymorphonuclear leukocyte, and is set free upon the destruction of those corpuscles. When glandular activity is at its highest, leukocytosis occurs, hence an increased amount of nuclein, and concurrently an increase in the germicidal property of blood-serum. The number of kinds of nuclein is limited only by the different varieties of cells.

While Vaughan and other authors look upon nuclein as the essential element that gives the blood-serum its specific germicidal properties, there are others (probably the majority) who maintain that the ductless glands—thyroid, thymus, suprarenal and pituitary bodies—all secrete certain essential principles, which not only are used for the general body nutrition, but also aid in protecting the system against attacks by pathogenic microorganisms.

Many look upon nuclein as the prototype which gives rise, by decomposition, to alloxin bodies, of which uric acid is a member, and it is believed that the latter product in great part depends upon the amount of nuclein destroyed in the system, and that it rises or falls concurrently with the destruction of nuclein.

Chemically, nuclein consists of a complex proteid base and nucleinic acid, containing from 5 to 9 percent of phosphorus. The terms "nuclein" and "nucleinic acid" are often used interchangeably, as it is generally impossible to obtain nucleinic acid from the albuminous base. Physiologically, nuclein acts by stimulating glandular activity with increase in the number of polymorphonuclear leukocytes, and therefore an increase in the germicidal action of blood-serum. By some authors nuclein is supposed to be the "natural antitoxin."

Nuclein has a selective action and is not germicidal to certain varieties of bacteria. It, however, kills the tubercle bacillus. Introduced into the system hypodermically, it causes, within 3 to 5 hours, an increased frequency of the pulse, a rise of 1 degree or more in the temperature of the body and an increase in the number of multinuclear leukocytes (leukocytosis). In 76 cases of tuberculosis in all stages and with no exclusions, Vaughan reports recovery in 24 percent. King reports 30 similar cases with 22 percent recoveries. The remedy to be effective must be given hypodermically, once daily, over long periods (frequently months), selecting a slightly alkaline solution. Vaughan employed the 1 percent solution in doses of 60 to 80 minims, while King used the 5 percent solution in doses of 50 minims.

Nuclein has been successfully used in diphtheria, suppurative tonsillitis and other suppurative disorders, also in chronic rheumatism and malaria, chronic bronchial catarrh and neurasthenia.

Experience goes to show, however, that in cases in which there is rapid destruction of living tissue and great depression the remedy is of no benefit and may do harm.

NUCLEOALBUMIN.—One of the series of nucleins obtainable from cell protoplasm, poorer in nucleinic acid than the plastins of the nucleus. It appears to be the most constant of the proteids obtainable from cell protoplasm, but is not confined to cells, being the chief constituent of tissue-fibrinogen. The chief proteid of milk (*caseinogen*), the so-called mucin of bile, and the mucinoid substance in the mucus of urine, are nucleoalbumins. Nucleoalbumin is insoluble in acetic acid, precipitable by magnesium sulphate, not reducible by prolonged heat in the presence of an acid. It is formed by the combination of nuclein and albumin in the process of digestion. It contains phosphorus. The presence of nucleoalbumin in the urine has been observed in leukemia, icterus, diphtheria, and in scarlatina and other varieties of nephritis.

NURSING.—See Infant Feeding, New-born Infant.

NUTMEG.—See Myristica.

NUTMEG LIVER.—A mottled appearance of the liver, the center of the acini being dark, while the periphery is lighter in color. The condition is seen especially in passive congestion and in fatty infiltration. See Liver.

NUX VOMICA (Poison Nut, Quaker Button, Dogbutton).—The dried, ripe seed of *Strychnos nux-vomica*, containing not less than 1.25 percent of strychnin. Its properties are due mainly to two alkaloids—strychnin and brucin—with the properties of which its own properties are identical. In small doses it is a bitter tonic, exciting the secretions and stiumulating the functions of the body. In larger doses it exalts the function of the spinal cord, causing tetanic spasms of the extensor muscles. In toxic doses it paralyzes the functions of the spinal cord, arrests respiration, and causes death by suffocation. It is valuable as a general tonic in cardiac failure, in hemiplegia, dyspnea, and in certain forms of amblyopia. Strychnin is now the acknowledged remedy for inebriety. The tincture of nux vomica is excellent in atonic dyspepsia and gastric catarrh, especially in drunkards and in constipation from atony. It is valuable in neuralgia, in the condition known as torpid liver, and, through its influence on the pneumogastric, in many kinds of coughs. Dose, 1/2 to 1 1/2 grains.

The alkaloid strychnin is also contained in the St. Ignatius' bean, or ignatia in the proportion of 1 percent, and in the bark of the tropical blindweed, a creeping vine found in the mountains of Tonquin and Cochin China.

Poisoning by strychnin has some points in common with tetanus. In the latter affection the lower jaw first manifests stiffness, and is affected throughout the attack, while in poisoning by strychnin the jaw is not affected until late, and then only during the paroxysm. The diagnosis of strychnin poisoning from hysteria requires attention only for a short time.

Treatment.—Vomiting should be encouraged if convulsions have not already set in; in such case the stomach-pump may be used. Quiet and absolute rest are to be obtained as soon as possible, and the patient removed from every irritation, as a mere touch may set up a convulsion. Large doses of chloral hydrate may be given in doses of 1/2 dram, repeated in a half-hour. Potassium permanganate given in large doses may be antidotal. Tannic acid forms an insoluble tannate, and iodin in dilute solution and soluble iodids are antidotes. Butylchloral hydrate is a very active antagonist. Potassium bromid is too slow in action for practical use. Chloroform or ether may be used to bring about muscular relaxation. Hydrastin hydrochlorid, in doses of 1 grain hypodermically, has been successfully employed, and amyl nitrite has been given by inhalation with good result.

Incompatible with *nux vomica* and *strychnin* are alkalies and their carbonates, bromids, iodids, chlorids, and all other alkaloidal precipitants. Oils and fats retard the absorption of strychnin salts. Physiologically incompatible are aconite, alcohol, amyl nitrite, atropin, chloral hydrate, chloroform, curarin, digitalis, hydrocyanic acid, morphin, nicotin, paraldehyd, physostigmin, potassium bromid, urethane.

Preparations.—**Extract Nucis Vomicæ** should contain 5 percent of strychnin. Dose, 1/8 to 3/4 grain up to a maximum in 24 hours of 2 grains. **Fluidextract Nucis Vomicæ** should contain 1 percent of strychnin. Dose, 1/2 to 1 1/2 minims. **Tinct. Nucis Vomicæ** should contain 1/10 percent of strychnin. Dose, 5 to 15 minims. **Strychnin,** an alkaloid obtained from nux vomica, ignatia, and other plants, crystalline, intensely bitter even in 1 to 700,000 solution, of alkaline reaction, soluble in 7 of chloroform, 110 of alcohol, 6700 of water. It is a constituent of ferri et strychninæ citras, pil. laxativæ comp., and the elixir, glyceritum and syrupus ferri quininæ et strychninæ phosphatum. Dose, 1/100 to 1/30 grain. **Strychninæ Sulphas,** crystalline, efflorescent, odorless, of intensely bitter taste, even in 1 to 700,000 solution, neutral reaction, soluble in 50 of water, in 109 of alcohol, and in 2 of boiling water, insoluble in ether. It contains 75 percent of strychnin. Dose, 1/100 to 1/20 grain, but after tolerance is attained much larger doses may be safely used. **Strychninæ Nitras,** soluble in 90 parts of cold water, 3 of boiling water, in 70 of alcohol, and in 26 of glycerin, insoluble in ether. It contains 84 percent of strychnin, and is preferred to the sulphate for hypodermic use, being less irritant. Dose, 1/100 to 1/20 grain, or more after tolerance is attained. The nitrate in doses of gr. 1/30 to 1/20, hypodermically three or four times daily for a week, and less frequently for two weeks longer, removes the craving for stimulants, counteracts the vasomotor paralysis to which most of the injurious effects of alcohol are due, and is probably in other respects a true antagonist to the action of that narcotic poison on the human organism.

NYCTALOPIA.—Nyctalopia etymologically means night-blindness, but the general usage making the term mean night-vision is so strongly intrenched that it is useless and confusing to reinstate the old significance. The condition in which one sees better at night, relatively speaking, than by day, is due to some lesion in the macular region rendering it blind; at night the pupil dilates more than in the daytime, and hence vision with the extramacular or peripheral portions of the retina is correspondingly better. Nyctalopia is a symptom of serious retinal disease, and not a disease in itself. All night-prowling animals have widely-dilated pupils, and in addition to this they have in the retina a special organ called the *tapetum lucidum*, the function of which is to reflect to a focus in front of them the relatively few rays of light that enter the widely dilated pupil, and thus enable them the better to see their way. Hence, the luminous appearance of the eyes of such animals in the dark.

NYMPHÆ.—See VULVA.

NYMPHOMANIA.—See MANIA.

NYSTAGMUS.—Involuntary oscillation of the eyeball due to spasmodic jerking movements of the eye, not interfering with the voluntary movements, but accompanying them. It is the result of defective coordination. The involuntary movements may be horizontal or vertical, oblique, or rotations about the visual axis. Internal squint is a frequent accompaniment, and there may be simultaneous shaking of the head.

The commonest form of nystagmus is that coming from some deficiency of vision in both eyes, beginning in childhood, particularly in amblyopia, the result of the destructive changes after ophthalmia neonatorum and in retinitis pigmentosa. It also exists in microphthalmos, albinism, and some varieties of congenital cataract. Miners who constantly strain their eyes in the darkness sometimes develop the disease. Nystagmus from cerebral disease is only of symptomatic significance. It is especially important in the diagnosis of multiple sclerosis.

Treatment, beyond simple rest and the relief of the distressing symptoms, is of little value. It must always be remembered that there is a possibility of improving the visual acuity and modifying the disease by correcting lenses The prognosis of the nystagmus is never encouraging, even under the most favorable circumstances.

O

OAK.—See QUERCUS.

OBESITY.—Obesity may be defined as an excessive development of fat throughout the body. There are two forms, the anemic and the plethoric.

Etiology.—Heredity is a potent factor. Overindulgence in carbohydrates, fats, and albumins is a frequent cause. Diseases marked by defective oxidation, as chlorosis and sexual continence, are often the exciting conditions of this disease; so, too, is lack of exercise or muscular inactivity.

Morbid Anatomy.—Increased subcutaneous fat, rounded face, pendulous cheeks, protuberant abdomen, and gross legs and buttocks are evident. There is an accumulation of fat over the chest and in the mediastinum, and enlarged liver and increased intraabdominal fat. In the later stages there is a fatty infiltration of the heart-muscle.

Pathology.—Although corpulent individuals may eat but little fatty foods, they are frequently hearty eaters of all classes of foods. The carbohydrates are not only directly productive of fat-increase, but by saving the stored fat, indirectly aid in the development of this condition; hence sugars, starches, and alcohol (beer in particular) are productive of corpulence. Alcohol, by hastening the metabolism of albumin, sets free fat-producing substances which may be stored. Diminished oxidation from anemia, for example, or lack of muscular exercise, favors this condition.

Symptoms.—The increased bulk of the patient renders his movements sluggish and may interfere with locomotion, producing a waddling gait. Dyspnea, from mechanic interference with respiration, fatty chest-wall, mediastinal fat, or enlarged liver, are early symptoms. Later, a true cardiac dyspnea from fatty infiltration of the heart-muscle, secondary to arteriosclerosis, may arise. A late symptom is the effusion which takes place, showing itself as anasarca, ascites, hydropericardium, and hydrothorax. Eczema, secondary to intertrigo, adds much to the discomfort of the patient.

Prognosis.—Marked corpulence is not incompatible with long life and considerable comfort. When excessive, the conditions mentioned are likely to supervene, and death, often sudden, results. The prospect of recovery is lessened by the fact that most patients find the treatment irksome, and are induced with great difficulty to continue it.

Complications.—The obese are especially prone to contract heart disease, diabetes, asthma, gallstones, apoplexy, gout, disturbances of secretory organs. They stand major operations poorly and can make little resistance when attacked by severe acute infections.

Treatment.—Two indications present themselves: (1) Diminish the food-supply, and (2) oxidize the fat already stored. For the first, 3 prominent systems are those of Banting, Ebstein, and Oertel.

The Banting system nearly excludes fats, forbids the largest possible amount of sugar and starches, and limits the daily amount of fluids taken to 35 ounces. The patients are practically starved, in that they are allowed only 20 to 25 ounces of dry food daily, about one-half of this being meat. The fault of this method lies in its failure to secure elimination of waste products, and it is likely to result in serious malnutrition.

The Ebstein method allows fat on the theory that it does not produce stored fat and clogs the appetite. Sugar- and starch-containing vegetables, as potatoes and all farinaceous foods—3 1/2 ounces of bread each day being excepted—are forbidden. The quantity of fluids is limited. Black tea, without milk or sugar, and light wines are allowed. A moderate amount of meat is permitted.

The Oertel system not only regulates the diet, but pays especial attention to the heart and circulation. For convenience, these patients are divided into 2 classes: (1) Those in whom there are no marked respiratory and circulatory disturbances, and (2) those in whom the oxygen intake is diminished, so that dyspnea is readily excited. For the first class double the amount of fat and carbohydrates, with a much larger amount of albuminates, is allowed, as compared with the second class. In the latter class the amount of liquid ingested is markedly reduced. As compared with the Ebstein and Banting systems, it gives nearly the same amount of albuminates as the Banting, and one-half to three-quarters more than the Ebstein. It allows from 3 to 4 times as much fat as the Banting, and from one-third to one-half as much as the Ebstein. For the carbohydrates, the same to one-third more than the Banting, and one-half more to double that of Ebstein. When exercise can be taken, the more generous diet of Oertel should be chosen. Other systems have been employed, and may be adapted to individual patients, but that of Oertel has a wider application than any other, especially when combined with systematic exercise to strengthen the heart-muscle and massage to stimulate the circulation. In detail, the diet should consist chiefly of albuminates—lean of roast or boiled beef, veal, mutton, game, and eggs. Green vegetables, as cabbage and spinach, are allowed; fat and carbohydrates only in small quantities, and 4 to 6 ounces of bread a day. The liquid drunk must be limited to 6 ounces of coffee, tea, or milk, morning and evening, with 12 ounces of wine, and 8 to 16 ounces of water during the 24 hours. In warm weather this amount may be slightly increased, but beer is absolutely prohibited. To prevent formation of fat, the following diet table should be observed:

Morning.—One cup of coffee or tea, with a little milk, altogether about 6 ounces. Bread, 3 ounces.

Noon.—Three to 4 ounces of soup; 7 to 8 ounces of roast or boiled beef, veal, game, or not too fat poultry; salad or a light vegetable; a little fish (cooked without fat); 1 ounce of bread or farinaceous pudding (never more than 3 ounces), and 3 to 6 ounces of fresh fruit. In hot weather, or in absence of fresh fruits, 6 to 8 ounces of light wine may be taken.

Afternoon.—Coffee or tea with milk to 6 ounces, with at most 6 ounces of water; exceptionally, 1 ounce of bread.

Evening.—One or 2 soft-boiled eggs, 1 ounce of bread, perhaps a small quantity of cheese; salad and fruit; 6 to 8 ounces of wine with 4 or 5 ounces of water. Thus far the indication has been to furnish less food for the patient to oxidize, and at the same time sufficient for purposes of nutrition.

The second indication is to increase the oxidation of fat in the body. This is accomplished by massage, exercise in the gymnasium, or, preferably, in the open air. The latter comprises walking, mountain-climbing, cycling, and, what is of great value when possible, horseback exercise. Turkish baths are useful to remove surplus fluids from the body, but should be employed with great hesitation if any circulatory disturbances are present. Of health resorts Carlsbad and Marienbad are most frequently chosen. Here the restricted diet, systematic exercise, and purgative waters combine to give relief. The regimen must be continued after the return of the patient to his home, else the betterment will not be permanent.

Of the drugs in popular use most are inefficient and many are harmful. It is not likely that any one drug will meet the various conditions arising from the complex processes which result in fat production and fat storage. Should these be mentioned individually, it would be merely to give their contraindications. The one which has given the best results is thyroid extract, and this must be administered with the precautions enumerated under THYROID TREATMENT (*q. v.*).

OCCUPATION NEUROSES.—A group of affections of the nervous system, characterized by the occurrence of spasm (cramp) and pain in groups of muscles in consequence of overuse or frequently repeated muscular acts. It has been noticed that many persons suffering from occupation neuroses have a family history of nervous affections.

Varieties.—Writers' cramp; piano-players' cramp; telegraphers' cramp; violin-players' cramp; dancers' cramp, etc.

The symptoms of any of the varieties named generally develop gradually and slowly, by a feeling of stiffness in the used member; the part feels fatigued and heavy, until it is impossible to use it, from the occurrence of spasmodic contractions; there is pain on using the affected muscles, often associated with tremor, and in many cases with an actual paralysis. Associated with the loss of power to follow the usual occupation are nervousness, mental worry, and often depression. There is often the sensation of prickling and numbness in the crippled member. The electrocontractility is preserved until the atrophy of nonuse develops.

Prognosis is often unfavorable, although some recoveries are reported.

Treatment consists of rest to the part and mental quiet, with tonics and other means to improve the general nutrition. Faradism in weak applications once or twice weekly seems useful. The following combination may be of value (Hughes):

℞.	Zinc phosphid,	gr. ij
	Extract of nux vomica,	gr. x
	Iron albuminate,	gr. xxx.

Make 30 pills. One after meals.

OCULOMOTOR PARALYSIS.—See EYE-MUSCLES (Paralysis).

OINTMENTS (Unguenta).—Soft, fatty mixtures of medicinal agents with a basis of lard, petrolatum, or fixed oils, with a solid fat, such as wax or spermaceti They are intended for application to the skin by inunction, and have a melting-point which is below the ordinary temperature of the human body. The official unguentum is prepared by fusing together 80 parts of benzoinated lard and 20 parts of white wax, and is the basis of 2 other ointments, while 9 have benzoinated lard, and 3 have lard as their basis. There are 24 official ointments.

TITLE.	PERCENT OF ACTIVE CONSTITUENT.	BASE.
Unguentum ...	White wax, 20; benzoinated lard, 80.	....
UNGUENTUM:		
Acidi borici.....	Boric acid, 10.....	Paraffin, 10; white petrolatum, 80.
Acidi tannici....	Glycerin and ointment.	Tannic acid 20.
Aquæ rosæ......	Stronger rose water, 19.	Spermaceti, 12.5; white wax, 12; almond oil, 56; borax, 5.
Belladonnæ.....	Extract belladonna leaves, 10.	Diluted alcohol, 5; wool-fat, 20; Benzoinated lard, 65.
Chrysarobini....	Chrysarobin, 6.....	Benzoinated lard, 94.
Diachylon......	Lead plaster, 50 ...	Olive oil, 49; oil of lavender flowers, 1.
Gallæ..........	Nutgall, 20........	Ointment, 80.
Hydrargyri.....	Mercury, 50; oleate of mercury, 2.	Prepared suet, 23; benzoinated lard, 25
Hydrargyri ammoniati.	Ammoniated mercury, 10.	White petrolatum, 50; hydrous wool-fat, 40.
Hydrargyri dilutum.	Mercurial ointment, 67.	Petrolatum, 33.
Hydrargyri nitratis.	Nitrate of mercury, abt., 12.5.	Lard.
Hydrargyri oxidi flavi.	Yellow oxid of mercury, 10.	Water, 10; hydrous wool-fat, 40; petrolatum, 40.
Hydrargyri oxidi rubri.	Red oxid of mercury, 10.	Water, 10; hydrous wool-fat, 40; petrolatum, 40.
Iodi............	Iodin, 4; potassium iodid, 4.	Benzoinated lard, 80; glycerin, 12.
Iodoformi.......	Iodoform, 10......	Lard, 90.
Phenolis........	Phenol, 3..........	White petrolatum, 97.

TITLE.	PERCENT. OF ACTIVE CONSTITUENT.	BASE.
UNGUENTUM:		
Picis liquidæ....	Tar, 50............	Lard, 35; yellow wax, 15.
Potassii iodidi...	Potassium iodid, 10; potassium carbonate, 0.6.	Benzoinated lard, 80; water, 10.
Stramonii.......	Extract of stramonium, 10.	Hydrous wool-fat, 20; benzoinated lard, 65; diluted alcohol, 5.
Sulphuris.......	Washed sulphur, 15.	Benzoinated lard, 85.
Veratrinæ.......	Veratrin, 4........	Benzoinated lard, 90; almond oil, 6.
Zinci oxidi......	Zinc oxid, 20.....	Benzoinated lard, 80.
Zinci steratis....	Zinc stearate, 50...	White petrolatum, 50.

The process of compounding an ointment or a cerate is sufficiently simple, being generally a mere matter of triturating the ingredients together in a mortar, or of their incorporation on a slab by means of a spatula. When extracts, powders, or gritty substances are ordered, the ingredients should first be pulverized into a fine powder, then triturated with a small quantity of the basis into a smooth, impalpable paste, the remainder of the basis being added gradually, until the whole is thoroughly incorporated. A warm mortar may be required for hard extracts. Soluble salts should be triturated with a little water before adding the excipient. Camphor needs a little alcohol to enable it to be pulverized, and iodin should be rubbed to a fine powder, a little alcohol then added, and finally the excipient by degrees. Sulphur iodid requires persevering work with a small portion of olive oil. Borax should be triturated with glycerin, and red mercuric oxid with distilled water. A bone or horn spatula should be used for all ointments, as steel or iron blades will injure many substances, particularly alkaloids, free acids, tannin or iodin, and several of the mercurial salts. Volatile substances should be added last, and quickly worked in, so that their evaporation may be as slight as possible.

OLD AGE.—The period of life in which the degenerative changes that set in after middle life become apparent. It does not correspond to any definite term of years, but is hastened by want, confinement, hardship, and mental anxiety, by exposure to mercurial and nitrous fumes, and the habitual use of alcohol and poisonous drugs. Some persons are old at 40, and some hardly so at 70. The normal anatomic and physiologic changes are well seen in the bones, which become more brittle and lighter, but without reduction in size, and hence fractures more readily produced, especially in the spongy portions of the bones, in the neck and trochanteric region of the femur. The cartilaginous portions of the body are thinned, slightly lessening the height. The alveolar processes of the jaw are absorbed, the teeth loosening and falling out, and the angle of the jaw is enlarged. The face is shortened and the chin protrudes. Voluntary muscles waste with ensuing loss of power and increasing difficulty in maintaining an erect carriage. The cardiac muscle shares in the general change, the heart-beat becoming weakened and often intermittent, the rate not being materially altered. The activity of the involuntary muscles diminishes. The powers of digestion become lessened, inducing constipation. The accommodation of the eyes fails; and the expulsive force of the bladder diminishes. The skin becomes wrinkled. There is shrinkage of the elastic tissues, and adipose tissue is absorbed and the cutis thinned; the hair-roots undergo atrophy, and the color of the hair is lost. The lungs, spleen, lymphatic glands, uterus, and ovaries become more or less atrophied, and the functional powers of testes diminish or cease. The brain and spinal cord shrink in size, reflex action becomes sluggish, and mental concentration and energy lessen.

Other morbid changes peculiar to old age are thickening of the walls of the arteries, atheroma, and calcification thereof. Thrombosis and embolism are not infrequent results, and cerebral hemorrhage is an imminent danger. The heart-valves are often atheromatous or calcified. Costal cartilages may calcify and impede respiratory movement. "Arcus senilis," a ring of degeneration, is often seen near the margin of the cornea, and cataract is common. The atrophy of mind may become actual dementia, and the lungs become emphysematous. Deafness and paralysis agitans are common, and joint-affections appear. Cirrhosis of the liver is seldom delayed to old age, while granular degeneration of the liver commences in old age. The prostate is liable to fibroid enlargement, causing retention of urine and the train of results dependent upon it.

Catarrhs of the air-passages are very prone to persist and extend, and to set up a form of lobular pneumonia. Wounds are liable to slough, but heal most readily. Fatality ensues in old age often from gradual enfeeblement of the powers without predominant lesion of any organ. Cerebral hemorrhage and cardiac failure are frequent modes of death, but pneumonia gives greatest mortality.

Moderate and continous activity of mind and body, moderate and regular hours of sleep, a spare diet, little or no indulgence in alcoholic liquors, and particularly a guarded use of flesh food, are the most salient points conducing to length of life. The very aged have seldom been addicted to the use of drugs. A robust frame, a bodily and mental stature above the average, the power of sound sleep, of speedy recovery after fatigue, good reproductive power, and long retention of the hair of the scalp are criteria of capacity for prolonged life.

Serious illness lessens the prospect. The very aged are seldom found to be the offspring of immature marriages, or to have contracted such themselves. Elder children appear to have an advantage over the younger.

In the treatment of illnesses of the aged, the failing powers of digestion, of repair, and of vasomotor accommodation must be kept constantly in mind. The dietary should contain less meat and more milk and farinaceous foods than that of the young or middle-aged. Fatty matters are less easily tolerated. Malted and predigested aliments may supplement the diet as age advances. Changes of temperature must be guarded against, and the liability to bronchitis should dictate caution in exposure to cold or damp air.

OLEATES.—Liquid solutions of metallic salts or alkaloids in oleic acid, intended for external administration. They are not definite chemical compounds, though the term is also employed in trade to designate certain solid preparations which are claimed to be chemical compounds of the same acid with various bases. There are 5 official oleates, three of which have olive oil, as well as oleic acid.

Title.	Composition
Oleatum:	
Atropinæ....	Atropin, 2 grams; oleic acid, 50 grams; olive oil to 100 grams.
Cocainæ.....	Cocain, 5 grams; oleic acid, 50 grams; olive oil to 100 grams.
Hydrargyri..	Yellow mercuric oxid, 25 grams; oleic acid to 100 grams.
Quininæ......	Quinin, 25 grams; oleic acid, 75 grams.
Veratrinæ...	Veratrin, 2 grams; oleic acid, 50 grams; olive oil to 100 grams.

OLEORESINS (Oleoresinæ).—Liquid preparations consisting principally of natural oils and resins extracted from vegetable substances by percolation with acetone. They differ from fluidextracts in not bearing any uniform relation of c.c. to the gram of drug, in containing principles which though soluble in acetone are not so in alcohol, and in some instances being devoid of principles which are insoluble in acetone but soluble in alcohol. They are the most concentrated liquid preparations of drugs which can be produced. The official oleoresins are 6 in number.

Title.	Average Yield and Properties.	Dose.
Oleoresina:		
Aspidii......	10 to 15 percent. Tæniacide.	30 grains.
Capsici......	5 percent. Stimulant, rubefacient.	1/2 grain.
Cubebæ......	18 to 25 percent. Diuretic, expectorant.	7 1/2 grains.
Lupulini.....	50 percent. Tonic sedative.	3 grains.
Piperis......	5 percent. Stimulant......	1/2 grain.
Zingiberis ...	6 to 8 percent. Stimulant..	1/2 grain.

OLFACTORY DISEASE.—See Anosmia.

OLIGOCHROMEMIA AND OLIGOCYTHEMIA.—Deficiency in hemoglobin and red cells respectively. See Blood.

OLIGOHYDRAMNIOS.—See Amnii, Liquor.

OLIVE OIL (Sweet Oil, Salad Oil).—"A fixed oil expressed from the ripe fruit of *Olea europæa*" (U. S. P.). Cotton-seed oil, poppy oil, colza oil, ground-nut oil, and lard oil are used in immense quantities as substitutions for olive oil, since, with the exception of the common adulterant, cotton-seed oil, which is slightly irritating, all these varieties of oil have many of the properties in common with olive oil. By exposure to the air, olive oil soon becomes rancid. Olive oil enters into the composition of several cerates, ointments, and plasters, notably emplastrum plumbi and unguentum diachylon. Olive oil is emollient and protectant.

Carbolized oil, consisting of a 5 to 10 percent solution of carbolic acid in sweet oil, was at one time extensively used in the treatment of wounds. Since it has been shown that the amount of acid employed is ineffective, so far as any antiseptic properties are concerned, the practice has been abandoned. Sweet oil was in extensive use as a wound dressing, especially after amputation, by the older surgeons. It had the advantage of being bland and unirritating and not allowing the dressing to adhere to the cut surfaces. Olive oil forms one of the substances in repute for the preparation of instruments used in the surgery of the mucous cavities. In the treatment of unusually tight strictures of the urethra, the injection of a little sweet oil with a syringe will often prove more serviceable than anointing the instrument. As an emollient, sweet oil is largely employed in enemata. It has a special tendency to soften scybala and assist in their removal. It also serves to reduce the irritation which accompanies the presence of seat-worms. It is also used in large and frequently repeated doses in cases of biliary colic. Olive oil enters into the composition of a number of preparations employed in the local treatment of skin-diseases. Employed alone, it is useful to soften crusts and scales and to remove epithelial débris as a preliminary to more active treatment.

OMENTOPEXY.—See Liver, Cirrhosis.

OMPHALORRHAGIA.—See Umbilical Cord.

ONOMATOMANIA.—Functional derangement of speech, of which 5 varieties are described: (1) A powerful effort to recall some word; (2) an irresistible impulse continually to repeat a word, by which the patient seems perplexed; (3) the patient attaches some peculiar and dreadful meaning to a commonplace word; (4) the patient attaches talismanic significance to certain words, which he repeats as a safe guard; (5) the patient is impelled to spit out some word, like a disgusting morsel. A word is a complexus of images, localized in certain centers of the cerebral cortex, the images being partly auditive, partly visual, partly motor. "Onomatomania is characterized by irregular action of one or several verbal images, resulting from some functional disturbance of the corresponding center." In *simple onomatomania* the patient is possessed with the idea of recovering a word that escapes him. The word is familiar; its significance can be given; the place where read or the time when heard can be given, but the word cannot be recalled. Articulate speech may be at fault. The patient knows the word, sees it written before him, but cannot articulate it. He may utter a synonym or a similar word. In *associated onomatomania* words acquire a peculiar or preponderant meaning. See Aphasia, Speech Defects, etc.

ONYCHIA.—See Nails (Diseases).

OPEN-AIR TREATMENT.—In conjunction

with vaccine therapy open air is advocated in empyema. It is efficacious in burns, lobar pneumonia, bronchopneumonia, inoperable cancer, pulmonary and surgical tuberculosis. It is used conjointly with X-rays to prevent recurrence after operation for carcinoma of the breast. See Burns, Tuberculosis, etc.

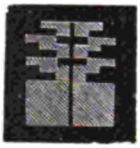
OPERATIONS IN GENERAL.—See Abdominal Section.

OPHTHALMIA NEONATORUM.—See Conjunctivitis (Purulent).

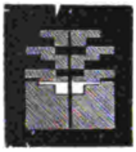
OPHTHALMIA, SYMPATHETIC.—See Sympathetic Ophthalmia.

OPHTHALMIC REACTION OF TUBERCULOSIS.—See Tuberculin.

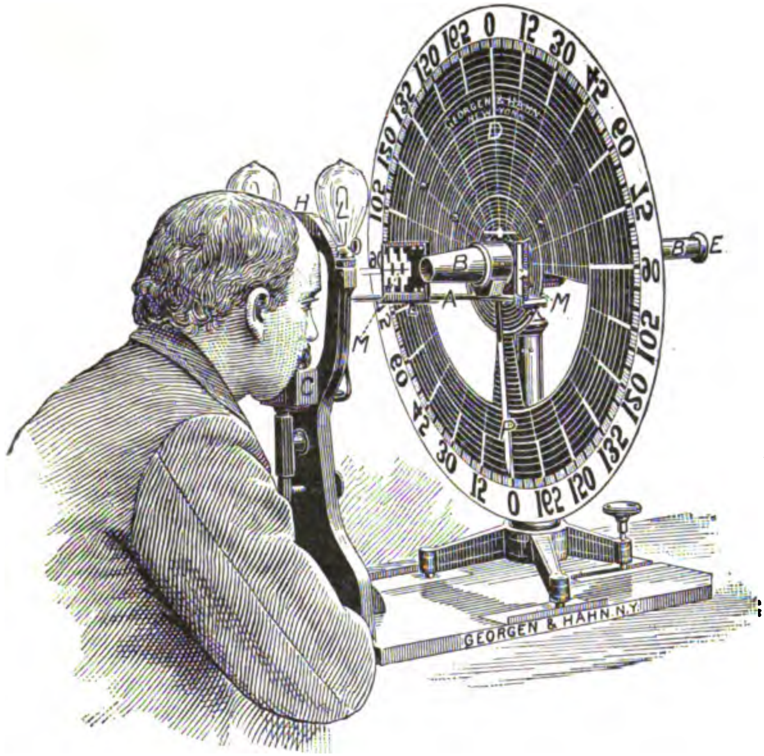
OPHTHALMOMETER.—An instrument used for the determination of the kind and amount of corneal astigmatism. It is less exact than the retinoscope, and, moreover, it is very expensive. That of Javal and Schiötz consists of a telescope attached to a graduated arc, upon which are two objects called mires, the left one being fixed, while the right is movable. These mires are of white enamel, one quadrilateral in shape and the other the same size, except that on one side it is cut out into 5 steps. The observer looks through the tube, which contains a combination of convex lenses and a bi-refracting prism, and sees 4 magnified images in a line on the cornea under examination. He first finds the meridian of least refraction by moving the semicircular arm to the position in which the 2 central images are furthest apart. The mires are then moved together until the 2 central images on the observed cornea touch and their central black lines coincide—the lowest step of one image with the side of the other. The arm is now turned at right angles to this meridian, and the overlapping of the 2 central images is noticed; for each step overlapping there is a difference of 1 diopter between the meridians. In higher degrees of astigmatism we add 5 diopters to the number of steps protruded on the other side. At 5 diopters of astigmatism the steps exactly cover the plain quadrangular mire.



Mires Exactly Approximated.



Mires Overlapping One Diopter.



The Ophthalmometer of Javal and Schiötz.

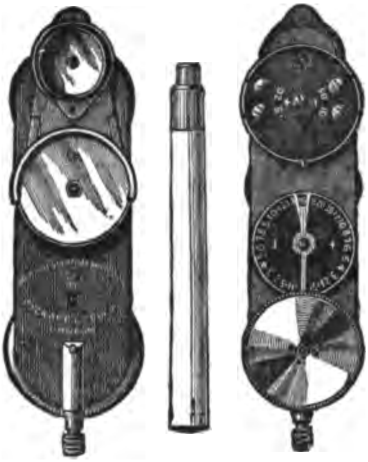
A. The perimeter-bar. *B*, *B*. Telescope. *C*. Chin-rest. *D*. Disc of radiating lines and concentric circles. *E*. Eyepiece at which the observer sits. *H* Head-rest. *L*. Lights, *M*, *M*. The mires, or targets. *P*. Pointer, indicating the axis by the degree numbers on the peripheral border of the disc.

The meridian of least curvature corresponds to the axis of astigmatism. The findings of the ophthalmometer are not exact. No account is taken of the lenticular astigmatism, and even though the cornea is at fault, no rules for adapting the ophthalmometric results can be formulated. Speaking broadly, the total astigmatism is approximately equal to the amount indicated by the ophthalmometer, expressed as myopic astigmatism, combined with an *inverse* myopic astigmatism of 0.75 D;. or, in other words, when there is no corneal astigmatism by the opthalmometer, the test-lens will likely show about 0.75 D of inverse astigmatism (Bull).

OPHTHALMOPLEGIA.—See Eye Muscles (Paralysis).

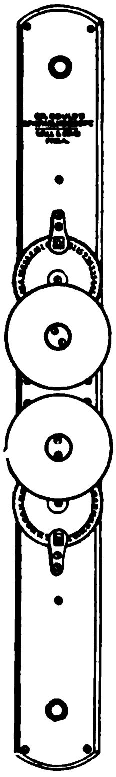
OPHTHALMOSCOPY. Theory.—It is self-evident that rays reflected from the fundus of the eye emerge from the eye in the same direction as that in which they enter it, the refractive media of the eye having the same action on light whether passing in or out. However, as ordinarily seen, the pupil is black. There is no light reflected from the patient's eye into ours, because our own eyes are not a source of light. Now, if the observer's eye is artificially made the source of light, and if he looks in the same direction as that in which the luminous rays enter the observed eye—as, for instance, through the sight-hole of a mirror—illumination renders the interior of the eye visible. This is the fundamental principle of the ophthalmoscope; and it was first explained and made practical by Helmholtz in 1851.

Description.—The simplest form of ophthalmoscope is a mirror with a hole in the center, which is held close to the patient's eye in such a manner as to reflect light from a luminous point near by into it, illuminating the interior of the eye, and revealing the details of the fundus. The ophthalmoscopes in use to-day are of more intricate mechanism, and render the examination much easier and more satisfactory. The mirror most used in this country is small, concave, oblong or round in shape, with a central aperture of from 2 to 4 mm. in diameter, and so arranged that it can be tilted or rotated from side to side, thus saving the trouble of inclining the whole instrument to reflect the light properly. By means of various ingenious appliances, a series of lenses are incorporated with the instrument in such a manner that, by turning a wheel with the finger, the convex or concave lens of the strength desired can be brought before the sight-hole in the mirror. By arranging the lenses so that they can be combined, the range may be extended from a fraction of a diopter to a lens of as high power as is ever required. The large mirrors are more useful in the indirect method, in retinoscopy, and for illuminating a large surface of the eye. In the direct method a very small mirror is as good or better than a large one. A small sight-hole gives a more distinct image, and does not necessitate so much accomodation or optic aid in examining slightly ametropic eyes. The large sight-hole is better for the accurate estimation of refraction. As the direct method is more generally employed, and refraction is not ordinarily estimated by ophthalmoscopy, and retinoscopy is usually performed with a special plane retinoscopic mirror, for all practical purposes it is better to use a small mirror with a small sight-hole.



Morton's Ophthalmoscope.

There are many forms of ophthalmoscopes, for all of which some advantage is claimed. The model of Loring is cheap, and answers all practical purposes, but it is awkward to use, and necesstates removal from the eye and a combination of lenses to secure the higher powers. More expensive and, at the same time, more convenient are the models of Morton, Harlan, Gould, Pyle, and others.



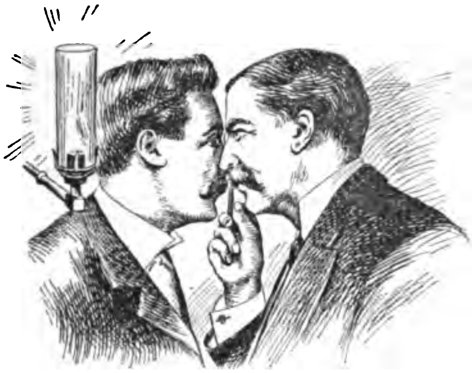
Gould's Ophthalmoscope. (8 1/2 in. ×1 in.)

Pyle's Ophthalmoscope. (Actual size)

Use of the Ophthalmoscope.—The ophthalmoscope may be used in 2 ways—by the direct and indirect methods.

Direct Method.—The patient is placed in front of the source of illumination, and to the side of the eye to be examined, the light behind him so that it shines on his temple, just touching the tips of the outer lashes. He is then told to look straight ahead to an object on a level with his eyes across the room. To examine the patient's right eye, the surgeon sits or stands, and holds his ophthalmoscope in his right hand before his own right eye. To examine the patient's left eye, he places himself to the left of the patient and holds the ophthalmoscope in his left hand before his own left eye. The ophthalmoscope is brought close to the eye under examination, the mirror of the ophthalmoscope having been inclined, and the instrument held in such position that the light from the source of illumination will be reflected directly into the patient's pupil; then, if the media are clear, a red glare, called the **fundus reflex,** is seen through the hole in the mirror. If the examiner wears glasses, he need not remove them; in fact, if he is astigmatic, he had better accustom himself to working with his correcting lenses on.

Examination of the Media.—The reaction and form of the pupil are noticed. If a foreign body or opacity is present in the pupillary area, it appears as a dark spot on a red background. A slight corneal opacity appears only as a mere shadow. It must be remembered that spots on the cornea and lens always maintain their same relative position and are immovable, while opacities in the vitreous are usually freely movable, and can be diagnosed by their change of position as the patient turns the eye quickly in various directions and then looks straight forward. To **locate corneal** or **lenticular opacities,** in addition to focal illumination advantage is taken of the phenomenon of **parallactic displacement,** which is governed by the rule that opacities lying in front of the pupil move in the same direction as the patient's eye, while opacities behind the pupil move in the opposite direction to the patient's eye, and the extent of this apparent movement enables one approximately to determine the distance of the opacity either in front or behind the pupillary plane. After having observed any anomaly of the pupil or media at a distance of from 12 to 16 inches, a strong convex lens (10 D. to 16 D., according to its location) is then wheeled before the sight-hole of the ophthalmoscope, which allows the observer to approach closer to the patient's eye, and greatly magnifies the conditions present.



Direct Method.

Examination of the Fundus.—If the media are clear, the surgeon approaches close to the patient's eye, and at once the details of the eye-ground become visible. The refractive media of the eye magnify the details of the fundus about 14 times, and by this fortunate circumstance the minute details of the eye-ground are plainly visible. Probably the first distinct object will be a retinal vessel which can be easily traced to the most prominent part of the fundus, the **optic disc.** At this point a bright whitish or pinkish reflex is seen, standing out in sharp distinction to the surrounding red fundus. By adjusting the proper lens before the sight-hole in the mirror the outlines of the disc may be brought sharply into view. The average size of the normal disc, as seen by the direct method, is nearly that of a 25-cent piece or a shilling, while to the naked eye it measures only 1.5 mm. Emerging from the disc is seen the central retinal artery and vein, dividing into inferior and superior branches. The veins may readily be distinguished from the arteries by their darker color and their size—about one-fourth larger. Pulsation of the veins is observed under normal circumstances, while pulsation of the arteries indicates a pathologic condition—either rise of intra-ocular tension or decrease of blood-pressure. Reflexes consisting of bright lines in the middle of the blood-vessels are seen. Frequently a depression may be seen in the disc called the **physiologic cupping,** caused by the branching of the internal fibers of the optic nerve at a lower level than the more external ones. This is white, with a surrounding zone of pink. **Pathologic cupping** includes the whole of the disc, and is characteristic of glaucoma. The form, the size, the color, and other appearances of the disc must be further studied. At the external border of the disc is often seen a black, circular *pigment ring,* bounding the opening in the choroid through which the optic nerve enters. To the outer side of this is the *white scleral ring,* which is not always distinctly circular. A white conus, or even a crescent, may be seen at the edge of the disc if there is choroidal atrophy. In high myopia this condition is noticeable. If there is distinct sign of cupping, the extent may be approximately estimated by the refractive conditions of 2 points lying at different elevations. The difference in diopters in the lenses required to distinctly focus the 2 points multiplied by 0.35 of a mm. will give the difference in depth. It is usual to select one point at the bottom of the cup, and the other near the surface.

The parallax test is based on the fact that in the indirect method, while the whole fundus seems to move along with the lateral movements of the convex lens, the floor of the excavation apparently moves in the same direction, but at a slower rate. This parallax is more marked the deeper the excavation.

The general aspect of the eye-ground is then studied, and any abnormalities in the retina, choroid, or sclera should be noted. If there is absence or deficiency of pigment between the retina and choroid, the larger choroidal vessels are seen through it, and the eye-ground is streaked with well-defined interspaces. At any portion of the fundus in which both the retina and choroid are lacking, the white, glistening sclera is seen shining through. To examine the **macular region** the patient is told to look into the light coming from the mirror, or, better, beyond it in the same direction, which movement of the eye generally brings the macula into view. This appears as a dark spot isolated in the fundus, with a small, bright spot in the center, called the *fovea centralis.* There are usually no vessels to be seen in this vicinity. The macular region should always be studied carefully, as any lesion or hemorrhage in this location has an important bearing on the vision of the patient.

Refraction by the ophthalmoscope is usually accomplished by the direct method. Refraction of the macular region is desirable, but as the intense dazzling produced by light makes it almost impossible, the disc is usually the objective point selected. The observer first corrects his own ametropia, and as much as possible relaxes his accommodation. It is this inability to regulate the relaxation of accommodation that makes this test unreliable in simple errors of refraction, and in the lower degree of astigmatism it is comparatively worthless even in the most skilful hands. The retinoscope is a more important and more scientific instrument for the objective method of refraction. Having relaxed the accommodation and corrected his own error, the surgeon moves before the eye the lens which gives him the best outlines of the disc, and subtracts his own correcting lens from the result. In cases of astigmatism the disc is usually oval, its long diameter corresponding to the axis of astigmatism. Two vessels at right angles to each other in the principal meridians are refracted separately, and the results noted. Glasses should not be prescribed from the ophthalmoscopic refraction alone.

Indirect Method.—The indirect method is less valuable than the direct. The image is inverted and less magnified (3 or 4 diameters), but one is able to see a larger part of the fundus at a glance, and is not compelled to approach so near the patient's face. It also enables the surgeon to intensify his illumination in cases of very small pupil or of cloudy media. In this country the indirect method is being less and less used. The method of procedure is usually the same as in the direct method, except that the surgeon keeps his eye a foot or more away from the patient's face and holds in front of the patient's eye a strong convex lens. However, the surgeon need use but one eye, and may stand directly in front of the patient. The lens is usually held at such a distance from the eye that the iris just disappears from view; a plus spheric 4 D. lens may be held before the opening in the mirror to enlarge the image and to replace the observer's strain of accommodation. By directing the light from the mirror through the lens into the eye, an inverted aerial image is formed in front of the lens, and it is this image that the surgeon sees. In high degrees of myopia it is easy to examine the inverted aerial image without a convex lens.

INDIRECT METHOD.

The satisfactory use of the ophthalmoscope, both in examining the fundus and approximately estimating the kind and degree of ametropia, can only be obtained after considerable practice. A normal fundus in both a light-complexioned and dark-complexioned person should be repeatedly studied, as abnormal conditions are not recognized until one is thoroughly familiar with the normal healthy fundus.

OPISTHOTONOS.—A tetanic condition of the muscles, particularly of the back, whereby there is an arching backward of the trunk, which may rest upon the head and heels. The condition is seen in poisoning from strychnin, in tetanus, hydrophobia, hysteria, and other tetanic conditions. In rare instances the muscles in front of the spine are affected, when **emprosthotonos** is the term used to describe the condition, the patient's body being arched forward. **Pleurothotonos** is the term used when the body is bent to one side or the other.

OPIUM.—The inspissated juice of the unripe capsules of the *Papaver somniferum*, or poppy, obtained by incising the capsules and collecting the milky juice which is exuded. Most of the opium in the American market comes from Smyrna, Asia Minor. Opium is a very complex substance, and contains, besides morphin and codein, a large number of less important alkaloids—narcein, narcotin, thebain, laudanin, papaverin, cryptopin, and meconin, opianin, paramorphin, and meconic, thebolactic, and sulphuric acids, in addition to a variety of extractives. Good opium should yield at least 9 percent of morphin. The dominant physiologic action of opium is the relief of pain. It also causes slowing of the respiration and pulse, contraction of the pupils, diaphoresis, and constipation; more rarely, nausea and vomiting, headache, itching of the skin, erythema; occasionally, instead of sleep, wakefulness, delirium, even convulsions.

Therapeutics.—The chief indications for the use of opium are: (1) To relieve pain from any cause except acute inflammation of the brain; (2) to produce sleep, particularly in the insomnia of low fevers with delirium, in which the combination of morphin and chloral is very efficient; (3) to allay irritation in the various forms of acute nervous erethism; (4) to check excessive secretion, as in diarrheas, dysentery, diabetes, ptyalism, etc.; (5) to support the system in low fevers and other adynamic conditions, when sufficient food cannot be retained; (6) as a sudorific, to produce sweating in coryza, etc. It is considered of especial value in any irritation of the stomach, bladder, or bronchi, in severe vomiting, both forms of diabetes, gastralgia, colic, and muscular spasm.

Superficial pain is often alleviated by the plaster or by liniments containing laudanum or some other fluid preparation. The oleate of morphin is said to be very penetrating.

Intense pain, as from the passage of calculi, is best met by the hypodermic injection of morphin sulphate in full doses (1/4 to 1/2 of a grain) with atropin sulphate (1/100 of a grain). Either the solution of morphin or the liquid preparations of opium may be given by the mouth in corresponding doses for the same purpose.

Sedative action is obtained by different preparations for different organs. The stomach is best affected by the solution of morphin in effervescing solution. The intestines may be influenced by laudanum in a starch enema, or internally by Dover's powder, powdered opium, or the pill of opium, especially the latter, with or without calomel, as an astringent when the bowel must be paralyzed, as in peritonitis, hernia, intussusception, etc. The rectum and other pelvic organs are promptly affected by a suppository of the extract of opium, 1/4 of a grain, with 1/12 of a grain of the extract of belladonna. The ovaries and the abdominal and pelvic organs generally are markedly susceptible to the analgesic action of codein in doses of 1 to 2 grains for an adult in severe pain.

To **produce sleep,** the most efficient preparations are the tinctures, the solution of morphin, pill of opium, and Dover's powder, in doses corresponding to the degree of insomnia and restlessness present.

Cough is relieved by the troches, the tinctures, and by the solution of morphin in small doses with syrup of wild cherry or syrup of tolu; also by codein in the last-named syrup.

Diaphoresis is obtained by the use of Dover's powder in either of its forms.

Children bear opium badly, and for them its proportionate dosage should be much smaller than for other agents. Morphin should not be given to children less than 10 years of age, and never hypodermically to those under the age of 15. Opium given to a nursing mother will effect the child, being partly excreted in the milk.

Poisoning.—In a child 1 day old 1 minim of laudanum has caused death. A medicinal dose given to a nursing mother proved fatal to the infant. A few drops of paregoric have killed a child of 9 months. In the adult 1/6 of a grain of morphin in one case, and 4 grains of crude opium in another, have proved fatal.

A toxic dose produces at first restlessness, increased mental activity with a feeling of exhilaration, cardiac stimulation and flushed face. Then follows the stage of stupor, when the patient feels drowsy, and falls into a deep sleep. The pulse is slow and full; respirations are slow and labored; pupils are contracted ("pin-point"); the skin is warm and dry. During this stage, the patient can be aroused, but quickly goes to sleep again. The patient passes insensibly into the third stage in which coma is absolute, and which is characterized by cyanosis; respirations feeble and irregular; muscular relaxation; pulse weak and rapid; relaxed, cold, clammy skin; the pupils dilate just before death which occurs from paralysis of the respiratory center due to direct action on the medulla. Postmortem shows only congestion of the brain, congested lungs, and engorgement of the venous trunks and of the right heart.

The coma produced by opium-narcosis, when deep and when a history of the case cannot be obtained, is almost impossible of differential diagnosis from that due to alcohol, apoplexy, uremia, epilepsy, etc. The odor of breath may point to laudanum or some other preparation of opium. The pupils are very much contracted in opium poisoning. See Coma.

Treatment.—Potassium permanganate is the best antidote to opium or morphin in the stomach, given in dose about one-half greater than the quantity of morphin present, and repeated in less quantity from time to time in cases where the poison has been administered hypodermically, so as to neutralize the morphin excreted by the gastric mucous membrane. If an opium preparation has been taken, or the alkaloid morphin itself, vinegar should be added to the permanganate solution. Atropin antagonizes the cerebral action of morphin, also its action on the pupils, respiration, heart, and arterial tension; but if given too freely, it will endanger the case by substituting belladonna-narcosis for opium-narcosis; 1/120 of a grain hypodermically every 15 minutes for 3 doses is generally sufficient. It is unsafe to be guided in this respect by the pupils. Caffein is also physiologically antagonistic, and is generally used in the form of strong black coffee, frequently administered.

The chief indications in opium- or morphin-poisoning are to antidote any of the poison in the stomach and to wash out that viscus repeatedly at short intervals; to maintain respiration and keep up the circulation; and to prevent sleep by noises, flagellation, or electricity. Strychin is an efficient antagonist to the respiratory paralysis, and may be used in lieu of atropin, or in connection therewith. Amyl nitrite should also be used when the heart shows signs of failure. Capsicum, the tincture, 1/2 to 1 ounce, by injection into the rectum, is said to give almost instantaneous results in antagonizing the stupor of opium-posioning. For further directions, see under Poisoning.

Preparations.—O Acetum. (*black drop*), opium-strength 10 percent, with nutmeg and sugar in dilute acetic acid. Is now 1/3 weaker than formerly, having the same strength and dose as tincture of opium. **O. Deodoratum** (*denarcotized opium*) is powdered opium free from narcotin and the odorous principles, which are supposed to cause the unpleasant after-effects of the drug. It should yield 12 to 12 1/2 percent of morphin, and is a good preparation, being a purified opium with a fixed morphin standard. The proprietary article named *Svapnia* is a similar preparation. Dose, 1/2 to 3 grains. **O. Emplastrum**—contains of extract of opium 6 parts, adhesive plaster to 100. **O. Extractum,** an aqueous extract containing 20 percent of morphin, and freed from principles insoluble in water. Dose, 1/4 to 2 grains. **O. Granulatum,** opium dried and reduced to a coarse powder. It should yield from 12 to 12 1/2 percent of morphin. Dose, 1/2 to 3 grains. **O. Pilulæ,** each pill contains about 1 grain of powdered opium incorporated with soap. Dose, 1 to 3 pills. **O. Pulvis**—opium dried at a temperature not exceeding 185° F., and reduced to a very fine powder. It should contain not less than 12 nor more than 12 1/2 percent of crystallized morphin, when assayed by the official process. Dose, 1/2 to 3 grains. **Pulvis Ipecacuanhæ et Opii** (*Dover's* *powder*)—has of ipecac 10, powdered opium 10, sugar of milk 80, rubbed together into a very fine powder. Dose, 5 to 15 grains. **O. Tinctura,** *laudanum*, opium-strength 10 percent, or 48 grains to the ounce. Morphin-strength about 6 grains (equal to 7 1/2 grains of morphin sulphate) to the ounce. Ten minims equal 1 grain of opium or 1/8 grain of morphin. Sixty minims equal on the average about 120 drops. Dose, 5 to 30 minims, according to the effect desired. **O. Tinctura Camphorata,** *paregoric*, has of powdered opium 4, benzoic acid 4, camphor 4, oil of anise 4, glycerin 40, diluted alcohol to 1000. Half an ounce contains nearly 1 grain of powdered opium. It is about 1/20 of the strength of laudanum. Dose, for an infant 5 to 20 drops; for an adult 1 to 4 drams. It is an ingredient of mistura glycyrrhizæ composita. **O. Tinctura Deodorati,** an excellent liquid preparation, being freed from all the noxious and useless ingredients soluble in alcohol and ether. Opium-strength 10 percent, average morphin-strength 6 grains to the ounce. Dose, as of tincture of opium. Drops of this preparation nearly equal minims. *McMunn's elixir* is a similar preparation, so also is another proprietary nostrum named *papine*. **Tinctura Ipecacuanhæ et Opii,** has of tincture of deodorized opium 100 evaporated to 80, fluidextract of ipecac 10, diluted alcohol to 100. Is intended to represent Dover's powder in liquid form. Dose, 5 to 15 minims. **Trochisci Glycyrrhizæ et Opii,** each troche contains of powdered opium 1/12 of a grain, with extract of glycyrrhiza, acacia, sugar and oil of anise. Dose, 1 to 4 troches. **O. Vinum** (*Sydenham's laudanum*), opium-strength 10 percent, with the aromatics cinnamon and cloves of each 1 percent, in alcohol and white wine. A vinous tincture decreased somewhat in strength from the wine of 1870. Dose, as of tincture of opium. Drops of this preparation are larger than those of the tincture. See MORPHIN.

OPIUM HABIT.—An irresistible craving for opium or its alkaloid, morphin. It is most frequently acquired as the result of long-continued administration of morphin, to relieve some suffering caused by a painful or incurable malady, or for insomnia. Heredity and a neurotic tendency are predisposing factors. Alcoholics often become morphin fiends. The chief symptom is the craving for the drug. Among other symptoms are irresolution, loss of self-control, moral obliquity, and untruthfulness. Epigastric pain or nausea, or both, are frequently complained of toward the time when another dose is due, though whether this is actual or feigned is not always easily determined. Mental depression is a more constant and characteristic symptom, associated with insomnia, intense anxiety, restlessness, and a sense of impending evil, all relieved for a time by the dose. Diarrhea rather than constipation is not infrequent.

Treatment.—Successful treatment is scarcely possible outside an institution, and even within one serious difficulties beset the way, chief of which is the deception practised by the patient. Patients should be divested of their own clothing and put to bed in hospital garb, because in this way alone can we be sure that morphin is not concealed about the person. In the case of women, whenever possible, a separate nurse should be assigned to each case. The latest testimony favors complete and sudden withdrawal of the drug as furnishing a short struggle, though a severe one. Such treatment is usually followed by diarrhea, vomiting, and insomnia. Some counsel even that no adjuncts should be employed, but certainly there can be no harm in the employment of general tonic treatment and remedies directed to the irritability of the stomach and torpor of the liver. A calomel purge is useful at the start. It is a well-established fact that, as in alcoholism, the patient should be well nourished, given such food as milk, cream, beef-juice, or beef peptonoids, rich broths, and beef-teas. When there is great asthenia, aromatic spirit of ammonia, strychnin, and digitalis may be given as directed under ALCOHOLISM (*q. v.*). If possible, an occupation of an absorbing kind should be furnished. In most cases it is impossible to secure the consent of the patient to sudden and complete withdrawal, when the gradual plan must be adopted. The success of either plan depends on securing effectual control of the patient, and if this cannot be obtained, all efforts fail (Tyson).

Chloralamid is probably the best hypnotic. It is not easy of administration, because of pungent taste and difficult solubility. Ten or twenty grains are a moderate dose, and are easily soluble in a fluidram of a mixture of 2 parts alcohol and 1 part glycerin. Of this solution 2 teaspoonfuls should be given in a glass of sherry wine or 4 tablespoonfuls of milk at the ordinary temperature. Trional and sulphonal or somnal may be given in 15- to 20-grain doses dissolved in hot water. Hyoscin in doses of 1/96 of a grain may also be tried. Chloral itself may be used in doses of from 10 to 30 grains. If there is cardiac weakness, the dose should not exceed 10 grains. Chloralose may be given in 5-grain doses in wafers or in hot milk. See LAMBERT TREATMENT FOR NARCOTIC ADDICTION.

OPOTHERAPY.—See ORGANOTHERAPY.

OPSONIC INDEX.—See OPSONIN THERAPY; SERUM THERAPY; VACCINE THERAPY.

OPSONIN THERAPY.—Substances in the blood serum that prepare bacteria for phagocytosis are known as opsonins. They are destroyed by heating to 60° C. The opsonic index denotes the relative power of the leukocytes to devour pathogenic organisms and is determined by mixing equal volumes of washed leukocytes, patient's serum, and emulsion of the organism in question. A similar mixture is made with the substitution of normal control serum instead of the patient's serum. After the mixtures have been in the incubator 15 minutes at 37° C., a drop of each is placed on a slide; a smear is made and stained. The average number of organisms in a definite number of leukocytes (*i. e.*, 50 or 100) represents the bacillary index, the average number in each leukocyte indicates the phagocytic index; the patient's value divided by the normal control gives the opsonic index.

In order to fortify the resistance, *i. e.*, the phagocytic power, of the patient, which is often weakened by infection, substances known as bacterial vaccines are introduced to reinforce the opsonins. An inoculation of dead cultures of the organism in question is made, the aim being to raise the opsonic index.

After each injection there is a fall in the opsonic content, called by Wright the "negative phase," then follows a rise, "positive phase," evidenced by improvement in the condition of the patient. The injection should be made only in the latter phase. See VACCINE THERAPY.

OPTIC NERVE ATROPHY. Causes.—The vast majority of cases are postneuritic—that is, following some inflammation of the optic nerve. Most cases are due to some disease of the brain or spinal cord, especially of syphilitic origin. Of the cerebral diseases might be mentioned disseminated sclerosis, progressive paralysis, and general paralysis; of the diseases of the spinal cord, locomotor ataxia is a prominent cause. Mechanic pressure from tumors, traumatism, embolus in the central artery, cutting off the blood supply, and the toxic agents, causing retrobulbar neuritis, lead to optic atrophy. Blindness, or amblyopia following severe hemorrhages, is supposed to be due to atrophy of the optic nerve. Sexual abuse, "catching cold," physical and mental excesses, have all been set down as causes.

Symptoms and Diagnosis.—The patient notices an early disturbance of vision, consisting of diminution in the central acuity, concentric contraction of the visual field, both for white and colors, and irregular scotomas. There is no pain, and seldom photophobia. Of the colors, green is first lost, and blue last; light-sense is longest retained. The ophthalmoscopic appearances vary with the cause. If the atrophy is subsequent to papillitis, the disc is increased in size, and there is more or less obliteration of its outline and distention of the veins. In simple atrophy instead of the rosy, healthy hue of the normal disc, the papilla may be grayish-blue or quite white. The outlines have a striking sharpness, which gives the shining disc its characteristic appearance. The disc appears sunken and excavated, and allows the network of the lamina cribrosa to be seen through the spaces left open by the disappearance of the nerve-fibers. The vessels diminish in size, and the capillaries of the papilla are no longer visible.

Prognosis is serious. The probability of retaining the vision yet left is small, and the result is usually total blindness.

Treatment should be directed to the cause; constant, increasing doses of strychnin should be given, orally or hypodermically, and the continuous electric current should be applied until it is found to be of no avail. Good results have recently been reported from the combined use of mercuric chlorid and nitroglycerin.

OPTIC NEURITIS. Synonyms.—Choked disc, papillitis, neuroretinitis. **Choked disc** is so called on account of the interference of return of blood through retinal veins by pressure from swelling at this point. **Papillitis** generally describes an inflammation limited to the intraocular head of the optic nerve, although in all probability, in the majority of cases, the nerve is affected throughout its entire length. There is less swelling than in choked disc, the visual disturbance appears earlier, and the disease leads to atrophy and blindness more frequently than does choked disc. **Neuroretinitis** and **papilloretinitis** are terms used to describe an inflammation which involves the retina as well as the optic nerve. It is characterized by hemorrhages, patches of fatty degeneration that appear as white spots, deposition of pigment, etc., similar to the changes in albuminuric retinitis.

Causes.—The condition often called choked disc may be due to traumatism, but is usually the result of a brain tumor, and is commonly bilateral. Tumors of the cerebellum and those at the base of the brain pressing upon the sinuses are most likely to be followed by choked disc. Some form of optic neuritis is said to accompany 90 percent of all cases of brain tumor. If unilateral, the disease is probably caused by a tumor in the orbit. Other intracranial diseases causing inflammation of the optic nerve are: Tuberculous basilar meningitis of children, epidemic cerebrospinal meningitis—in fact, meningitis from other infectious diseases or from any suppurative origin. Infectious diseases, syphilis, lead-poisoning, and other systemic affections may directly cause optic neuritis. Tumors or diseases of the orbit may have the same effect. Traumatism and inflammation of surrounding tissues are also causes.

Pathologic Anatomy.—Cerebral tumors interfere with the circulation and distribution of subarachnoid fluid in the lymph-spaces. The sheath of the optic nerve becomes much swollen and pyriform. It is supposed that the bacilli of the causative meningitis act directly upon the nerve-head.

The line of distinction between retinitis and neuroretinitis is so slight that we can probably associate closely the causes of the former with those of the latter; however, in albuminuric neuroretinitis the greatest changes are in the retina rather than in the nerve-head, and the urinary tests are quite indicative. Cases of inflammation of the optic nerve in which the cause is unknown are sometimes seen. Occasionally, several members of a family—the males particularly—and of apparently healthy parents, are attacked between the eighteenth and twenty-fourth years by a bilateral optic neuritis. In other cases, "catching cold," suppression of the menses, lactation, etc., are given as causes. In such cases there must be a suspicion that there was latent inflammation which became prominent under the conditions mentioned, and was not directly due to them.

Symptoms and Diagnosis.—The systemic condition is often simultaneously affected. The principal ocular symptom is impairment of vision, gradually passing into total blindness. In the early stages of choked disc vision is not markedly impaired. Particularly typical are diminution of central visual acuity, unsymmetric contraction of the visual field, and impaired color-sense. The ophthalmoscopic appearance of choked disc is a swelling and opacity in the disc and its immediate neighborhood. That the papilla is larger than normal and projects into the vitreous may be proved by the parallax test. The papilla, while undergoing inflammation, has what has been called a woolly appearance, together with swelling and congestion. The small vessels of the disc are dilated, so that many of them are visible, unless masked by excessive edema. There may be numerous capillary hemorrhages in the nerve-head. The retinal arteries are diminished in size, and the veins are swollen and tortuous. The edges of the disc are lost, and a striated flame-like or grayish haziness spreads over the disc into the adjoining retina, nearly equal on all sides. In severe forms there are diffuse retinal hemorrhages and, perhaps, macular changes resembling albuminuric retinitis. In addition to the presence of choked disc, the discovery of hemianopsia and the use of Wernicke's sign will aid in the diagnosis of cerebral growth.

In the interstitial or descending neuritis the disc is not swollen as in choked disc; it is dull and edematous looking. Vision is usually more and sooner affected, owing to the greater length of nerve structure involved.

Prognosis.—The course is usually chronic, finally ending in optic nerve atrophy. Of course, the prognosis is affected by the cause. Cerebral tumors are usually fatal in a short time. The various forms of meningitis are always serious. Restoration of vision is doubtful; there is little hope of regaining lost visual power. However, cures, with restoration of normal visual acuity, and cures of amblyopia of every degree, have been reported.

Treatment is naturally directed to the cause. If the cerebral tumor can be located, surgical interference may be of value. A syphilitic gumma will yield to mercury and potassium iodid. If no cause is discernible, diaphoresis, the mercurials and iodids, and tonics may be tried. Blood-letting from the temporal region has been reported of value. Possibly mild cases recover spontaneously. If there is reason to suspect that the neuritis is orbital in origin, systemic teatment will prove of little value; and in well-defined malignant orbital disease immediate enucleation is imperative.

OPTIC NEURITIS, RETROBULBAR.—Inflammation of the optic nerve beyond the eyeball, in which the disc is not involved at first, papillitis arising in the advanced stage.

Causes.—Acute retrobulbar neuritis is caused by exposure to cold, acute infectious diseases, sudden cessation of the menses, and any condition which leads to a sudden exudation into the sheath of the optic nerve. The most common cause of the chronic form is excessive use of tobacco and alcohol, although lead-poisoning, syphilis, quinin, and other toxic agents may produce it. As a rule, both tobacco and alcohol are simultaneously used to excess, and act conjointly. The disease is often called *tobacco* or *alcohol amblyopia*, or *toxic* or *intoxication amblyopia*, although many authors distinguish between intoxication amblyopia and retrobulbar neuritis from other causes. It has recently been suggested that the central amblyopia is due to primary rather than to secondary macular disease—that is, that the disease starts in the macula and ascends the central fibers of the optic nerve.

Symptoms.—In the acute disease total blindness results in a few days, and there is often pain in the eye, increased by movement or pressure. The ophthalmoscope reveals a papillitis of moderate severity. In the more common chronic disease the chief symptom is slowly diminishing central vision. The patient complains that he sees indistinctly, especially in bright light, and that his vision improves at sundown. This is explained by the dilatation of the pupil as day light fades, and consequent stimulation of the unaffected perimacular region by the increased illumination. Examination with the perimeter shows a central scotoma, at first for color, and finally for light. At the onset the field of vision remains nearly normal, and only begins to be obliterated when fixation becomes impossible, and nystagmus results. With the ophthalmoscope there is first seen slight hyperemia of the disc, and later a grayish-white discoloration of the temporal halves of the papillæ. The outlines are obscured, the veins are enlarged, and the arteries are diminished in size.

Prognosis may be considered favorable if the disease has not progressed to atrophy, and if the patient can be made to stop drinking and smoking; but relapses are likely to occur whenever the abstinence is suspended.

Treatment.—In the acute form general blood-letting, active diaphoresis, and other antiphlogistic measures are indicated. In chronic cases abstinence from tobacco and alcohol must be enforced, and strychnin administered in increasing doses. If syphilitic, the disease yields to the mercurials and iodids. Any other discoverable cause should be treated according to the indications.

ORANGE.—See AURANTIUM.

ORBIT, DISEASES.—**Periostitis** is an inflammation of the periosteal lining of the orbit, particularly prevalent in scrofulous and syphilitic patients. The inflammation may be so extensive as to involve the frontal sinuses and produce necrosis of the underlying bones. A blow or a fall is usually the exciting cause.

The symptoms are dull pain, swelling and edema of the skin surrounding the orbital edge, and, if necrosis has taken place, a fistula discharging foul pus and bony débris. Cicatrisation of the fistula may lead to ectropion. The eyeball is rarely involved.

Treatment consists of leeches to the temple, cold compresses, and, if the patient is syphilitic, the administration of mercurials and iodids. If the disease reaches a suppurative stage, antiseptic poultices, incision, and drainage are indicated.

Orbital cellulitis, or inflammation of the connective tissue of the orbit, is due to periostitis or to any suppurative or inflammatory process in the vicinity of the eye; even inflammation about the roots of the teeth may cause it. Erysipelas, anthrax, and pyemia may result in metastatic orbital abscess; and, finally, infection after injury to the orbit or its contents is a cause.

The symptoms are pain, fever, general prostration, swelling and redness of the lids, edema and increased tension of the conjunctiva and lids, exophthalmos, fixation of the eyeball in a straight or deviating position, causing visual disturbance, and, after the pus escapes, a discharge from the orbit. In unfavorable cases panophthalmitis may ensue. Metastatic abscesses generally lead to death. Extension into the cranium is always to be feared.

Treatment consists in prompt incision—preferably at a spot showing signs of pointing—drainage, and antiseptic irrigation.

Injuries to the orbit may cause fracture of the bony wall or laceration of the soft parts. Foreign bodies may be received and retained in the orbit for varying periods of time. They may escape into the nasal cavities, or they may cause orbital inflammation, and even death. Luxation of the globe is generally produced by a wedge-shaped foreign body crowding between the eyeball and the orbit. Formerly, what was called "gouging" was resorted to by contestants in brutal fights, the object being to dislocate the eyeball from its socket with the point of the thumb. The danger is blindness from laceration or overstretching of the optic nerve.

Fracture of the orbit may be detected by palpation. If the neighboring sinuses are opened, there will be much emphysema about the lids, made worse by blowing the nose. There is late appearance (2 or 3 days) of extravasation and ecchymosis of the lids. If the optic foramen is involved, there is, sooner or later, blindness from pressure or injury of the optic nerve. When fracture of the orbit produces enough hemorrhage to cause exophthalmos, the prognosis is grave.

Treatment.—After orbital injuries the affected parts should be thoroughly disinfected and foreign bodies removed. The proximity of the brain to the orbit renders the prognosis doubtful in extensive fractures or infected wounds. Rest and cooling compresses are indicated. In luxation vision may be lost through stretching of the optic nerve, but may return after reposition of the eyeball and retention with a pressure-bandage. If the lids are closed tightly behind the globe, preventing replacement, the external canthus should be divided at once. The longer the eyeball is dislocated, the worse the effect upon vision.

Tumors of the orbit cause exophthalmos in the direction of pressure. The other symptoms are disturbance of motility and vision and pain, all of which vary according to the size and malignancy of the tumor. The chief tumors are osteoma and encephalocele of the orbital wall; tumors of the optic nerve; and sarcoma, cysts, and vascular tumors arising in the neighboring cellular tissue. A genuine orbital sarcoma is extremely rare, and carcinoma never originates in the orbit proper. All orbital tumors of any considerable size or malignancy should be removed after enucleation of the eye. There is little hope of cure of encephalocele.

ORCHITIC EXTRACT.—See TESTICULAR EXTRACT.

ORCHITIS.—See TESTICLE (Inflammation).

ORGANOTHERAPY.—The treatment of diseases by the administration of animal organs, or extracts prepared from them. Although organotherapy has existed in some form since the most ancient times, the method as now practised is of recent origin. Brown-Séquard, in 1889, suggested the employment of testicular juice in the treatment of the mental and physical deterioration incident to old age. Experiments which he had made upon himself had, he reported, yielded the most brilliant results. Physicians in different parts of France subsequently tested the properties of Brown-Séquard's extract, and found its dynamogenic action beneficial in diseases attended with debility, especially in senile changes, in pulmonary tuberculosis, leprosy, locomotor ataxia, general paralysis, and anemia. Paul, in 1892, under the name of "nervous transfusion," advocated the hypodermic use of an extract of sheep's brains in conditions of neurasthenia. The method of preparation of the various extracts as employed in France is that suggested by d'Arsonval. The organ is removed, with all possible antiseptic precautions, and is cut into small pieces of about 1 c.c. The segments are covered with pure glycerin and allowed to macerate for 24 hours. Before filtering, 2 or 3 parts of distilled water are added. Sterilization is accomplished by means of carbonic acid gas under pressure. The first step toward a rational application of the method of organotherapy was the subcutaneous transplantation of pieces of thyroid gland in cases of myxedema and cachexia strumipriva by Horsley and Kocher, and later the employment of extract of sheep's thyroid in myxedema, the credit of which belongs to G. R. Murray, of Newcastle, England. Since Murray's announcement, in 1891, the method has been extensively tested in England and elsewhere; many cases of myxedema have been reported as improved, and not a few cured. Gratifying results have also been achieved in sporadic cretinism, and in psoriasis and other chronic affections of the skin. Various preparations of the thyroid gland have been employed—*e. g.*, glycerin extracts, dry extracts in powder, and, finally, the uncooked or partially cooked gland has been used. In the particular case of myxedema neither the kind of preparation nor the mode of administration seems to be of much importance. The results have been practically the same whether a liquid extract was given by hypodermic injection, or a dry extract was administered by the mouth. The fresh gland, slightly fried and seasoned, has also been used, and at present is preferred by many. The success attending thyroid therapy in myxedema has led to the employment of many other organic extracts in diseases of corresponding organs. Extracts have been prepared from nearly every organ in the animal body; thus there are on the market: *Cerebrin,* from the brain; *medullin* or *myelin,* from the cord; *cardin,* from the heart; *musculin,* from muscles; *ossin,* from bones; *renin,* from the kidneys; *gastrin,* from the stomach; *pancreatin,* from the pancreas; *ovarin,* from the ovary, and *testin,* from the testis. Pituitary extract has sometimes proved beneficial in acromegaly. Splenic extract has been used with some success in exophthalmic goiter, and in insanity due to physical exhaustion. Thymus extract appears beneficial in leukocythemia, chlorosis, anemia, pernicious anemia, "status thymicus." Brain-extract has been reported as beneficial in various organic and functional diseases of the nervous system, such as locomotor ataxia, bulbar palsy, general paralysis of the insane; also in epilepsy, neurasthenia, migraine, hysteria, hebephrenia, and other conditions. Heart-extract is recommended for cases of nervous prostration. It is said to raise the blood-pressure, augment the quantity of urine, and increase the number of red blood-corpuscles. In diseases of the muscular system muscle-extract is also reported as of value. Extract of pancreas, containing the active ferments of the gland, has been administered with doubtful success in certain cases of diabetes mellitus, which disease, as is well known, is sometimes dependent upon morbid changes in the pancreas. Of all the extracts, that of the thyroid gland is still the one most successfully employed. Its use is not confined to the two diseases mentioned—myxedema and cretinism; it seems to be an efficient galactagog and is useful in promoting consolidation of obstinate fractures; it has also proved useful in diseases of the skin, in leukemia, and affections of the nervous system, both organic and functional, endometritis, menorrhagia, uterine fibroma and carcinoma, lupus, ozena, obstinate leg ulcers, progressive myopathy, simple goiter; in exophthalmic goiter, and diabetes mellitus and cases presenting much emaciation it is contraindicated. See THYROID TREATMENT.

ORPHOL.—Bismuth beta-naphtholate. An intestinal antiseptic. Dose, 5 to 20 grains in honey or milk. See BISMUTH.

ORRHOTHERAPY.—See SERUM THERAPY.

ORTHOFORM.—It has no chemical relation to cocain which it resembles only in its action on the sensory nerve terminations. It occurs as a white, crystalline, odorless and tasteless powder, almost insoluble in water. It is efficient as a local anesthetic only when it comes in contact with exposed sensory nerves, and has been used chiefly as a dusting powder or ointment for painful abrasions, ulcers or burns. Applied in powder to raw surfaces, as burns, and excoriated nipples, it has frequently produced local gangrene. Internally it has been given in doses of 8 to 15 grains for the pain of gastric ulcer and cancer. It does not relieve the pain of simple gastralgia, and hence it has been employed as a test for gastric ulcer. A saturated solution in collodion may be used as a paint, and an emulsion in glycerin is employed during operations within the uterus. The hydrochlorid is more soluble in water and may be used for internal administration or urethral injection, but is too acid for hypodermic injection or eye application. Its *incompatibles* are antipyrin, bismuth subnitrate, and silver nitrate.

ORTHOPEDIC SURGERY.—See GENU, HIP-JOINT DISEASE, TALIPES, etc.

OSMIDROSIS.—See BROMIDROSIS; SWEAT-GLAND.

OSMIUM TETROXID (Osmic Acid).—Obtained by the action of nitrohydrochloric acid on osmium. In persistent neuralgia it is injected into the nerve in doses of 1/2 to 1 c.c. of a fresh 1 to 2 percent solution. The cure is rarely permanent. It is contraindicated in renal disease.

OSTEOARTHRITIS.—See JOINTS (Diseases).

OSTEOARTHROPATHY, HYPERTROPHIC PULMONARY.—A disease first described by Marie, characterized by a bulbous enlargement of the terminal phalanges of the fingers and toes, a thickening of the articular ends of the bones, a peculiar curvation of the nails, and an enlargement of the lower jaw. According to Marie, the condition is usually associated with disease of the lungs or pleura, and results from the absorption of toxic products from the diseased foci. The disease is not allied to akromegaly. See BONE (Diseases), JOINTS (Diseases).

OSTEOCLASIS.—See GENU VALGUM.

OSTEOMA.—A bony tumor; exostosis. See TUMORS, BONE (Diseases).

OSTEOMALACIA.—Softening of bone from loss of its earthy constituents, occurring in adults, especially in females and in the course of pregnancy. The true cause of the disease is not known; by some it is considered to be infectious, but this view is not proved. See BONE (Diseases).

OSTEOMYELITIS.—See BONE (Diseases).

OSTEOPERIOSTITIS.—See BONE (Diseases).

OSTEOSARCOMA.—See BONE (Diseases).

OSTITIS.—See BONE (Diseases).

OSTITIS DEFORMANS (Paget's Disease).—A rare senile disease characterized by kyphosis of the spine, marked enlargement of the cranial part of the head, enlargement and deformity of the clavicles, and of the long bones of the extremities due to a rarefying ostitis. The abdomen protrudes; the ribs fall in and cause dyspnea; neuralgic pains are present; and there is some muscular atrophy, but the bones of the face, hands, and feet remain practically normal.

OTITIS.—See EAR (Diseases).

OTOSCOPE.—An instrument for examining the ear. What is ordinarily called and used as an otoscope is a rubber tube, one extremity of which is inserted into the ear of the subject, and the other extremity into the ear of the examiner, a current of air being passed by means of a Politzer bag and a eustachian catheter through the middle ear. In case of tympanic perforation the rushing sound made by the passing air is audible to the examiner. See EAR (Examination).

OVARIAN EXTRACT.—The substance of the ovaries has been administered with some benefit in the nervous manifestations and pathologic conditions which occur when the ovarian functions are partially or wholly arrested, as in cirrhosis or malignant disease thereof, or after the operation of ovariotomy. It is said to be of use in cases of depression or other mental disturbance coincident with the climacteric, to relieve ovarian congestion and neuralgia, and to be efficient in the treatment of delayed or scanty menstruation. See ORGANOTHERAPY.

OVARIOTOMY.—The removal of the ovaries and fallopian tubes. This operation is usually effected through an incision in the abdominal wall. Some operators, under certain circumstances, prefer the vaginal route.

The operation is performed for diseased conditions of the tubes and ovaries; for extrauterine pregnancy; for cysts and tumors of the ovary; and for cysts of the parovarium. See FALLOPIAN TUBES; OVARY (Diseases).

The removal of the tubes and ovaries was formerly advised in certain cases of fibroid tumors of the uterus to bring about a premature menopause, but at present the operation is rarely if ever done for that purpose. See UTERUS (Fibroid Tumors).

OVARY, DISEASES. Hernia.—Descent of the ovary into the inguinal canal, or even into the labium majus, has been noted occasionally. There may be no **symptoms** present, or there may be pain, which is much increased at the menstrual period. The characteristic sickening pain on pressure, the increase in size at the menstrual period, and bimanual examination will confirm the diagnosis.

Treatment should consist in replacing the ovary and sac, after which it should be kept in place by a properly applied truss. If the ovary is diseased, it should be removed.

Prolapse.—Downward displacement of the ovary without displacement of the uterus and tubes. For displacement of the ovary accompanying displacement of the uterus, see UTERUS.

The principal **cause** of prolapse of the ovary is some condition which increases its weight, such as prolonged congestion, inflammation, and subinvolution. Elongation and stretching of the ligaments of the ovary may result in prolapse. It sometimes occurs as the result of a violent strain or sudden effort.

The symptoms of ovarian prolapse are usually well marked and occasionally severe. Pain is the most constant symptom. It is increased by any movement or straining effort, such as walking or defecation. It is always more severe at the menstrual periods. The pain is dull and aching in character, and usually extends down the thigh. Associated with the pain are frequently found such symptoms as nausea and indigestion, headache, and nervous disturbances. Bimanual examination will usually reveal the ovary in its abnormal position. It is enlarged and excessively tender, the slightest touch causing intense pain. Occasionally it may be pushed in place by the examining finger, when it will remain there until the patient assumes the erect posture, or until she coughs or strains.

The treatment of ovarian prolapse will depend upon the condition which causes it. Prolapse of the ovary accompanying displacement or subinvolution of the uterus will usually be cured by restoring the uterus to a normal condition. In uncomplicated cases of ovarian prolapse the patient should be advised to assume the knee-chest position 2 or 3 times daily; the vaginal orifice should be opened so that its walls may be distended by air, and the woman should remain in this position for 5 or 10 minutes if possible, after which she should lie in the lateroabdominal position for a time. This restores the ovary to its normal position, and, in time, if efforts are made to reduce the size of the ovary and to secure contraction of its ligaments, it may remain there.

Return of the ovary to its normal size may be secured by relieving pelvic congestion. This is best accomplished by the use of saline laxatives; by frequent vaginal douches of hot water; by painting the vaginal vaults and cervix with tincture of iodin, and by the use of glycerin or glycerin and ichthyol tampons. If the ovary is diseased, or if it is bound down in its abnormal position by extensive adhesions, it will have to be removed. Occasionally, if the ovary is healthy, the abdomen should be opened and the ovary fixed in its proper position. Sometimes this may be accomplished by shortening the round ligaments or by ventrofixation. In other cases the infundibulopelvic ligaments should be shortened or the outer end of the ovary should be attached to the broad ligament at its upper posterior part. However, the ovary is ordinarily diseased.

Acute inflammation of the ovary (oophoritis) is usually the result of extension of inflammation from the tube. It is particularly apt to occur as the result of gonorrheal salpingitis or puerperal sepsis. It may occur as a complication of the eruptive fevers.

The symptoms of acute oophoritis are pain in the ovarian region, accompanied by rise of temperature and rapid pulse. There may be nausea and vomiting. Bimanual examination will reveal the enlarged tender ovaries.

The treatment consists of rest in bed, vaginal douches of hot water, hot fomentations over the lower abdomen, and free purgation. If the symptoms increase in severity and if suppuration occurs, laparotomy must be performed and the diseased structures removed.

Chronic inflammation of the ovary occurs in two forms. The follicular part of the ovary may be particularly involved, giving rise to the formation of numerous little cysts underneath the capsule, when it is called cystic oophoritis; or there may be an increase in the connective-tissue element of the ovary, diminishing its size and rendering it paler and harder, when it is called cirrhotic oophoritis. Chronic oophoritis is usually bilateral. The condition may persist after an acute attack, or it may be chronic from the beginning as the result of a mild form of infection transmitted from the tubes. Prolapse of the ovary, excessive sexual connection, and celibacy may be mentioned as less important causes.

Symptoms.—The most important symptom of chronic oophoritis is pain. It is worse just before the menstrual period, and is usually relieved after the flow is well established. The pain is exaggerated by the erect posture and by exercise or movement of any kind. Associated with the pain are commonly menorrhagia and reflex nervous disturbances. Bimanual examination will reveal the altered condition of the ovary. Accompanying it there will usually be found displacement of the uterus and disease of the tubes.

The treatment of chronic oophoritis is palliative or operative. Palliative treatment may prove successful when there is no accompanying disease of the tubes or uterus. It consists of prolonged rest in bed, mild purgation, hot vaginal injections, applications of tincture of iodin to the vaginal vaults and cervix, and the use of glycerin tampons. It may be necessary to begin the treatment by the repair of a lacerated cervix or perineum, or by a thorough curettage. Sexual connection must be prohibited during the treatment. If there is accompanying disease of the uterus and tubes, or if, after the foregoing treatment, the pain should persist or return, oophorectomy should be performed.

The relief afforded by palliative treatment is rarely permanent when this plan is pursued to tide the woman over the menopause. Palliative treatment is only applicable to women who can afford to be chronic invalids.

Cystic Tumors.—There are 3 classes of cystic tumors of the ovary:

1. *Oophoritic cysts*, which arise from the parenchyma of the ovary—the oophoron.
2. *Paroophoritic cysts*, which arise from the hilum of the ovary—the paroophoron.
3. *Parovarian cysts*, which arise from the parovarium.

Cysts of this last class while they do not arise directly from the ovary, have so close a connection with it that they may properly be classed as ovarian cysts.

Oophoritic cysts may be subdivided into (1) cysts of the Graafian follicles, (2) cysts of the corpus luteum, and (*c*) multilocular cysts.

Cysts of the Graafian follicles arise from distention and coalescence of the ovarian follicles. Such cysts may consist of a number of distended follicles or of one large follicle. They rarely attain a large size, usually ranging from that of a walnut to an egg. The wall of the cyst is thin and smooth, and is lined with epithelium, either columnar or stratified. It is filled with a straw-colored serum, having a specific gravity from about 1005 to 1020.

The condition is usually due to thickening of the capsule of the ovary, which prevents rupture and discharge of the Graafian follicle. These cysts are, therefore, retention cysts. Occasionally hemorrhage will take place in the cyst, when it will be found filled with a dark, chocolate-colored fluid.

Cysts of the corpus luteum are a variety of follicular cysts. They have a peculiar light-yellow color, and almost never exceed a walnut in size. They are caused by degeneration and distention of a corpus luteum.

The symptoms of the two varieties of cysts just described are not marked. There is usually some ovarian pain, and there may be menorrhagia or metrorrhagia.

The diagnosis must be made by a bimanual examination, which will reveal the enlargement of the ovary.

Unless the pain is intense, palliative *treatment* is indicated. Should the patient suffer severely, the ovary and probably the corresponding tube should be removed. If there is but one cystic cavity in the ovary, it should be incised, its contents evacuated, and the severed edges whipped over with fine catgut. It should be remembered that these cysts are limited in growth, and will never give rise to dangerous symptoms.

Multilocular cysts are cysts of unlimited growth. They are supposed to originate in a degeneration of the ducts of Pflüger. The wall of these cysts is thick and strong, and is composed mainly of fibrous connective tissue. It has usually 3 layers, which are most distinct in the neighborhood of the pedicle. These cysts are intraperitoneal in growth, and are attached to the ovary by a distinct pedicle, through which it obtains its nourishment. As these cysts increase in size, the septums between the loculi may be absorbed, so that, although the cyst is always multilocular at first, it may finally become unilocular. Traces of these septums are, however, always visible.

These cysts may vary in size from that of a fetal head to a tumor weighing as much as 200 pounds. The contents are usually syrupy in consistency and light in color, and may be dark brown or black. The specific gravity is always above 1010. If the lining membrane is epithelium, the tumors are known as simple multilocular cysts; if mucous membrane, they are called glandular cysts; if presenting the characteristics of the skin and its appendages, they are known as dermoid cysts.

Paroophoritic cysts are also called papillary cysts of the ovary. They arise from the hilum of the ovary, and probably originate in the remains of the Wolffian body. Since they grow from the hilum, or attached portion of the ovary, they are usually extraperitoneal, forcing their way between the layers of the broad ligament. As a rule, these cysts are not attached by a distinct pedicle.

The lining membrane is cylindrical epithelium, sometimes ciliated. Upon the interior of the cyst are scattered warty or papillary growths, from which it derives its name. These growths are usually pink in color and are very vascular, bleeding upon the slightest touch. They show a marked tendency to perforate the cyst wall, causing secondary papillary growths to appear on any organ with which they come in contact. The contents are usually a clear, watery serum, with a specific gravity of from 1005 to 1040.

These cysts are rarer than the multilocular cysts; they do not grow so rapidly, nor do they become so large; and they are frequently bilateral.

Parovarian cysts may be subdivided into (1) cysts of Kobelt's tubes and (2) cysts of the vertical tubes. They originate in the parovarium, the remains of a fetal structure lying in the mesosalpinx between the tube and ovary. Cysts of Kobelt's tubes are small pedunculated cysts about the size of a pea. They originate in the outer series of tubules of the parovarium. They are not important pathologically, since they cause no disturbance. They resemble very much the hydatid of Morgagni.

Cysts of the vertical tubes are of unlimited growth. They develop between the layers of the broad ligament, and are therefore extraperitoneal. The layers of the broad ligament are widely separated, and the fallopian tube is greatly elongated.

The ovary is not affected unless the cyst becomes large. Cysts of the vertical tubes may be either simple or papillary. The papillary varieties are rare, and present the same characteristics as the cysts of the paroophoron. The wall of the parovarian cyst is thin, and its contents are a clear serum with a specific gravity below 1010.

These cysts are small in size, slow in growth, and are almost invariably unilocular and unilateral. The following tables will recall the classification and characteristics of the cystic tumors of the ovaries:

CYSTIC TUMORS OF THE OVARY.

1. Cysts of the oophoron.	1. Cysts of the Graafian follicle.	Blood cysts.
	2. Cysts of the corpus luteum.	
	3. Multilocular cysts.	(a) Simple. (b) Glandular. (c) Dermoid.
II. Cysts of the paroophoron:	Papillary cysts of the ovary.	
III. Cysts of the parovarium.	1. Cysts of Kobelt's tubes.	
	2. Cysts of the vertical tubes.	(a) Simple. (b) Papillary.

MULTILOCULAR CYSTS OF THE OVARY.	PAPILLARY CYSTS OF THE OVARY.	CYSTS OF THE VERTICAL TUBES.
1 Intraperitoneal.	1. Extraperitoneal.	1. Extraperitoneal.
2. Pedunculated.	2. No pedicle.	2. No pedicle.
3. Multilocular.	3. Unilocular.	3. Unilocular.
4. Ovary destroyed.	4. Ovary normal.	4. Ovary normal.
5. Tube normal.	5. Tube normal.	5. Tube elongated.
6. Unilateral.	6. Bilateral.	6. Unilateral.
7. Specific gravity of contents above 1010.	7. Specific gravity of contents not diagnostic.	7. Specific gravity of contents below 1010.
8. No papillary growths.	8. Papillary growths.	8. Rarely papillary growths.

The symptoms of ovarian cysts are not at all diagnostic. There may be some menstrual disturbance, usually menorrhagia; pain may or may not be present. The pain of ovarian cysts is due to pressure, and is largely dependent upon the direction of growth of the tumor. Cysts growing into the pelvis between the layers of the broad ligament usually cause the greatest disturbance. Most frequently, if the cyst is intraperitoneal, the patient complains of no symptoms until the tumor has grown to sufficient size to distend the abdomen. Later she loses weight and strength, the general health fails, and her features assume a characteristic pinched expression, which has been called *facies ovariana.*

The physical signs of ovarian cysts are usually more distinct. Inspection may reveal a localized or general enlargement of the abdomen. Palpation will reveal a tense resisting tumor, usually smooth and regular in outline, which will give a distinct wave of fluctuation. Percussion shows dulness over the face of the tumor, with resonance above it and in the loins. The dulness does not change when the position of the patient is changed.

Bimanual examination will reveal the uterus normal in size, and usually displaced by the weight of the tumor. The lower segment of the tumor can generally be felt by the vaginal finger. Ovarian cysts may be mistaken for ascites, pregnancy, fibroid tumors of the uterus, and a fat abdominal wall with tympanitic distention of the intestines.

The prognosis is favorable if operation is performed. Ovarian cysts are not malignant in character, yet they frequently cause death by their rapid growth and great size. Pressure upon the uterus, with resulting kidney-disease, is another frequent cause of death. Other causes of death may be the various complications to which cysts are liable, such as inflammation and suppuration, torsion of the pedicle, hemorrhage, and rupture. Papillary cysts are particularly dangerous on account of their liability to rupture, with the formation of secondary papillary growths.

The treatment of ovarian cysts is operative. Even though the tumor has given no symptoms, it should be removed. Serious complications may arise at any time which will render its removal difficult, or which will destroy the patient in a few days. Tapping should not be resorted to on account of the many dangers which attend it.

Solid Tumors.—Solid tumors of the ovary are rare. They are found in about 5 percent of all cases of ovarian tumors. The most important are fibroma, myoma, sarcoma, carcinoma, and papilloma.

The treatment is removal as soon as diagnosed.

OVERLYING.—An accident which not infrequently happens to young children, and in which they are suffocated. It is usually the fault of drunken parents who, in sleep, roll over their infants. Evidence that a child has really died from this cause is afforded by (1) the postmortem appearance of death from asphyxia; (2) the absence of any other mortal disease, and (3) absence of evidence of any cause of asyphxia other than overlying. The statement that a child has been overlain should be received with caution. It is reasonable to suppose a child would escape from a suffocating position beneath bedclothes, or the body of another, or succeed by crying or struggling in awaking the nurse or another. A medical witness must consider all points before charging carelessness in this, or, on the other hand, allowing an act of wilful murder to pass under the guise of accidental death.

OXALIC ACID. $(COOH)_2$.—A colorless, crystalline solid, occurring in many plants as potassium oxalate. It is soluble in 9 parts of water and more soluble in alcohol. It is a respiratory depressant in 1/2 grain dose, and is a violent poison in large dose. It is serviceable in amenorrhea, in 1/2 to 3/4 grain dose, and it is classified as a direct emmenagog. It is commonly known as "salts of lemon" or of "sorrel," and is used for removing ink-stains; when taken internally, it results in poisoning. If a person immediately after swallowing a solution of a crystalline salt which tasted purely and strongly acid is attacked with burning sensation in the throat and then in the stomach, vomiting, particularly of bloody matter, imperceptible pulse, and excessive languor, and dies in half an hour, or still more in 20, 15, or 10 minutes, there is strong reason to believe that oxalic acid has been taken. The antidotes are the calcium carbonate or hydrate in such forms as lime-water, chalk, whiting or wall-plaster in water, or magnesia. Potassium and sodium carbonates and bicarbonates are to be avoided. Bland mucilaginous drinks should be given, and warm poultices should be applied to the abdomen. Cerium oxalate is official. See CERIUM.

OXALURIA.—A term used to indicate the presence of calcium oxalate in the urine in an undue amount. There is a white deposit on standing. It occurs in the urine of hypochondriac and depressed patients, and in that of gouty patients. Excessive venery and masturbation will produce it, as will the ingestion of certain foods, as rhubarb. See URINE (Examination).

OX-GALL.—See FEL BOVIS.

OXYGEN.—Oxygen is inhaled as a therapeutic agent in diseases of the respiratory organs and blood. It is essential to respiration, blood-formation, nutrition and tissue change, in fact to life itself; its combination with the tissues yields heat and other energy. Combustion is also dependent upon it, consisting of a rapid oxidation, with the evolution of heat and light. It exists also in an allotropic form known as OZONE (*q. v.*). See also HYDROGEN DIOXID.

OXYTOCICS or **ECBOLICS**, agents which stimulate the muscular fibers of the gravid uterus to contraction, and may therefore produce abortion. In small doses the same remedies are as a rule **emmenagog** (*q. v.*). Their mode of action has not been clearly made known, but it is generally believed to be due in some cases to direct stimulation of the uterine center in the cord, in others to congestion of the uterus producing reflex stimulation. The principal are: Ergot, ustilago, savin, potassium permanganate, hydrastis, borax, cotton-root bark, oil of rue, pilocarpin, viscum flavescens, strong purgatives.

Any drastic purgative, or gastrointestinal irritant, may produce abortion by reflex action. The *volatile oils* act in this manner, also *colocynth* and many other agents used by women to produce abortion, as *tansy*, *pennyroyal*, etc., all of which are dangerous to life in doses sufficient to excite the action of the gravid uterus.

OXYURIS.—See WORMS (Round-).

OZENA.—A chronic inflammation, with subsequent atrophy, of the mucous membrane of the nose, accompanied by the formation of dry crusts and by a very offensive odor. The great difficulty in dealing with ozena is the removal of the crusts and thickened secretions upon which the fetor depends. While the secretions remain, decomposition is present, and the diseased surface is never in condition for healing. The treatment, therefore, may be summed up in the words absolute cleanliness. The persistent use of the nasal douche should be continued until every trace of thickened secretion is removed. At first, or in neglected cases, hot fomentations and steam inhalations may assist in the removal. When the dried discharge adheres to the roof of the nasal cavity, a syringe may be used to wash it out, or it may be mopped out by pledgets of cotton-wool twisted around a probe. A solution of sodium bicarbonate may be used at first, and when crusts are removed, an antiseptic solution should be substituted. Potassium permanganate, zinc chlorid, zinc sulphate, carbolic acid, solution of chlorinated soda, potassium chlorate, silver nitrate, sulphurous acid, powdered alum, boroglycerin, glycerite of tannin, tincture of iodin, boric acid, chloral hydrate, and perchlorid of mercury may all be used locally in aqueous solution.

Cotton tampons may be saturated with:

℞.	Beta-naphthol or naphthol,	gr. xij
	Tincture of quillaja,	ʒ jss
	Distilled water, enough for	℥ j.

The interior of the nose may be painted with balsam of Peru, and tampons, saturated with the same drug, may be left in contact with the deeper parts of the cavity. This effectually destroys all fetor. Powders of boric acid, bismuth, camphor, tannin, calomel, and iodoform have been used, but they are less satisfactory than liquid applications. As a rule, ulcers heal readily under constant irrigation by weak saline or antiseptic solutions. When diseased bone is present, it must be removed before healing can begin. Curettage is often very successful. Syphilitic ozena requires local treatment with mercuric chlorid in solution of 1:5000 to 1:10,000. Calomel may be insufflated with advantage. Constitutional treatment is of great importance in ozena, and is especially required in strumous and syphilitic cases. See NOSE (Caries), RHINITIS (Chronic).

OZONE.—An allotropic form of oxygen, its molecule having the structure O_3. It is present in the atmosphere in small quantities, being produced constantly by the evaporation of water, by electric discharges, and in the growth of chlorophyll-containing plants. It is also formed during the slow oxidation of phosphorus, turpentine, and other essential oils. In the sickroom it may be produced by dissolving in water a mixture of manganese dioxid, potassium permanganate and oxalic acid. It is an active oxidizing agent, possessing bleaching and antiseptic properties. It has been recommended in cases similar to those in which oxygen is used; also in infectious diseases, as diphtheria. See OXYGEN.

P

PACHYMENINGITIS.—See Meningitis.

PACK.—A blanket wrapped about the body. A **cold pack** is a blanket wrapped about the body after having been wrung out of cold water. A **half pack** is one limited to the trunk. A **hot pack** is a blanket wrung out of hot water and wrapped around the body. A **wet pack** is a blanket wrung out of warm or cold water, and wrapped about the body or a part, and surrounded by dry blankets. It may be used as a means of reducing temperature (cold pack), or to produce sweating (hot pack).

PAGET'S DISEASE.—See Breast (Diseases).

PAIN.—Bodily or mental suffering. Distressing or agonizing sensation. It is usually due to irritation of sensory nerves, although there are said to be pains of central origin.

The qualifying terms applied to pain are: **P., Boring,** severe pain in bones of a boring character. **P., Electric.** See Pain (Fulgurant). **P., Fulgurant, P., Fulgurating,** the intense shooting, cutting pains affecting principally the limbs of patients suffering from locomotor ataxia. **P., Girdle,** a painful sensation as of a cord tied about the waist; it is a symptom of organic spinal-cord disease. **P., Growing,** a popular term for the soreness about the joints in young persons at puberty. Some attribute these pains to increased vascularity of the epiphyses of long bones; others believe them to be rheumatic. **P., Jumping,** the pain peculiar to disease of joints when the bone is exposed by ulceration of the cartilage. **P., Lancinating.** See Pain (Fulgurant). **P., Lightning.** See Pain (Fulgurant). **P., Osteocopic,** bone-tiring pains; a symptom of ostitis, periostitis, and secondary syphilis. **P., Shooting.** See Pain (Fulgurant). **P., Starting.** Synonym of Pain (Jumping).

General Diagnosis.—As an aid to diagnosis, the kind of pain and its location are often of higher value than any other symptoms. Thomson divides pain into 6 different forms: (1) That due to inflammation; (2) that due to pressure; (3) that due to stretching; (4) neuralgic pain; (5) subjective pain; (6) cutaneous reflex pain.

An investigation should begin with a request that the patient describe just where the pain is felt most, and where it first began. While he is doing so, the gestures which he uses should be carefully noted.

When the pain is due to inflammation, if external, as in a joint, the patient will avoid pressure upon the most painful part. If deeper seated, the gestures are often expressive of the varying kinds and distribution of the pain, according to the texture inflamed. Thus, the diffused soreness of a mucous-membrane inflammation causes the gesture of bronchitis to be made with the whole hand laid on the sternum, and then passed over and across the chest. A similar movement of the hand across the abdomen never implies peritonitis, but catarrhal intestinal inflammation. With pleurisy and peritonitis, on the other hand, the tips of the straightened fingers are used to indicate the stabbing nature of the pain. In the localized pain of commencing appendicitis the open hand is used, as with an inflamed joint. In pleurodynia the whole hand is pressed firmly to the side to prevent movement of the ribs. In rheumatic fever the pointing by the patient to the epigastrium or to the xiphoid cartilage, especially if followed by a movement from the precordium up the neck or into the left arm, is significant of cardiac inflammation. So also the gesture in gastritis, whether acute or chronic, is wholly different from that in colic. Inflammatory pains about the head may have very characteristic gestures. The use of one finger-tip to localize it on the scalp is strongly significant of intracranial syphilis. The finger-tips passing up the side of the face and stopping on the scalp an inch below the sagittal suture indicates pain ascending from a tooth, and should not be mistaken for trigeminal neuralgia. In conjunctivitis the hand is laid over the eye. In iritis the finger is pointed toward it, not touching it, and then passed up the forehead to the inner side of the nose or to the malar process. In glaucoma the gesture may be reversed, as if the pain were emerging from the orbit. All these gestures differ entirely from those of head pains not inflammatory. Meningitis, whether cerebral or spinal, is significantly indicated by absence or suppression of gesture, for reasons to be noted further on. There are exceptions to this in some cases of tubercular meningitis. But the gesture of myelitis, with both hands passed from the back across the abdomen to describe the cord- or band-like sense of constriction, is almost pathognomonic.

On the other hand, the gestures indicating the seat of greatest pain produced by pressure, as by tumors, abscesses, etc., or cramps, markedly contrast with those of inflammatory pains in showing no apprehension in touching or in moving the part. Here the locality indicated at first by the gesture is of importance to note, and whether, on repeating the question, the same place is again started from, because the patient's hand then moves in a fashion expressive of the extension or radiation of the pain from the original focus, although he may describe the pain as equally present at some distance from the spot first pointed out. Hence his unconscious repetition of the sign with which he commenced is of much significance. Thus, a patient with a growth springing from the lumbar vertebræ always first pressed the point of two fingers deeply into the abdomen below the umbilicus, while the fingers of the other hand moved over the sacrum, where he insisted his pain was chiefly. A fixed pain in the back caused by an aneurysm is often indicated by the extended thumb, and likewise the pain preceding herpes zoster, but no spinal inflammatory pain will elicit such a gesture, nor will the pains of so-called spinal irritation. In stretching pains, such as in biliary or renal colic, or cramps, as in lead colic, the contrast to inflammatory pains is shown by the forcible grasp or pressure which the patient makes on the abdomen, while the characteristic radiations of the different varieties may be very plainly represented. Even when the pain has ceased, the gestures descriptive of what he has experienced may be equally conclusive as to their nature (Thomson).

Inflammatory pains have three great characteristics. The first is that pain is elicited by pressure upon, or by handling, the inflamed part; and the rule is that pressure produces the maximum amount of pain at the site of the inflammation. This fact is useful in diagnosis, both positively and negatively. Thus, an inflammatory pain in the leg may be due to peripheral neuritis, to sciatica, to hip-joint disease, to gouty arthritis, to rheumatic arthritis, to muscular rheumatism, or to spinal meningitis, and each one of these may be distinguished from the others by appropriate palpation. In peripheral neuritis pain is most complained of on pressure upon the skin and superficial structures much more than when one lifts the whole limb in the hands or moves its joints. Sciatica is diagnosed by the special tenderness on pressure at the sciatic notch, along the course of the nerve down the back of the thigh, or deep in the popliteal space, or between the heads of the soleus in the calf; hip-joint disease by pressing the head of the bone against the acetabulum.

The second great characteristic of inflammatory pain is that it is increased by any form of movement of the inflamed part, not excepting its own proper functional movements. The inflamed part, therefore, is both voluntarily and involuntarily kept at rest as much as possible. This is done by muscular action, the afferent impression of this pain being reflected to all the associated muscles of the part to restrain their action, and even to muscles which, though not usually connected with the function of the part inflamed, may yet disturb it by their movements. Examples of the first kind are seen in the fixity of joints by the contraction of their muscles whenever and as long as the joints are inflamed, while the latter is shown by both the local or general rigidity of the abdominal muscles, according to the local or general state of inflammation underneath. Thus, comparative palpation made by both hands in the iliac fossæ is of help in the early diagnosis of typhoid fever. In appendicitis, from the commencement of the irritation, the muscular resistance over the cecum may give the impression of a solid tumor much before there has been time for exudation or pus-formation.

The third great characteristic of inflammatory pain is that it is accompanied by disturbance of the normal function of the injured part. This does not happen with the other varieties of pain—at least, as a characteristic of them. Neuralgic headache, for example, is not accompanied by delirium, or, ordinarily, by intolerance of light or of sound, as the headache of meningitis is. Neuralgic pains in the spine, in the arms, or in the legs do not produce stiffness nor fetter the movements of those parts whose chief functions are to execute movements, as do inflammatory pains. So the diagnosis between pleurisy and pleurodynia lies in the fact that the pain on movement of the ribs in pleurisy causes the functional symptom of cough, while that of pleurodynia does not, for the seat of the pain is not in the pleura at all.

Besides these three great characteristics of inflammatory pains, the sensation itself often varies in kind, according to the tissue involved. The rule is, the softer the texture, the more acute the pain; so that it may be described as only dull and heavy, as in inflammation of the liver or in pneumonia which has not involved the pleura. In inflammations of mucous membranes the pain, if moderate in degree, is more like a diffused soreness; if severe, it may be termed burning. Whenever griping or bearing-down sensations develop, it is because the inflammatory irritation has extended from the mucous membrane to the muscular coat of the wall of the canal or viscus which the membrane lines. Pain of inflamed serous membranes is much more acute than in the case of mucous membranes, and is likely to be lancinating or stabbing, as is indicated by the patient's gesture. Pain of inflamed fibrous tissues, such as muscular fascia, nerve-sheaths, periosteum, dura, etc., if moderate, is of a dull, aching character; but if severe, is very violent on account of the unyielding nature of the tissue. A serviceable indication of the seat of the inflammatory process is afforded by the susceptibility of patients with any form of fibrous-tissue inflammation to changes in the weather. In health there is a perfect adjustment between the centrifugal pressure of the circulation and the centripetal pressure of the weight of the atmosphere. Changes in the latter, as indicated by the fall in the barometer on the approach of a storm, are promptly compensated for by the nerve-fibrils being readily removed in the softer tissues from unbalanced intravascular pressure, but not so in the denser fibrous tissues. Hence the good, but inconvenient, barometers which a gouty man has in his toes, that may ache worse while the sky is yet clear, but which he knows, from experience, means that the clouds are on their way. It is well, therefore, to ask whether a headache complained of grows worse just before a storm, when you have reason to suspect that it is no mere functional trouble, but a cephalalgia of syphilitic origin (Thomson).

Referred Pains.—These are made clear by the illustrations, the following sections, and the table at the end of the article.

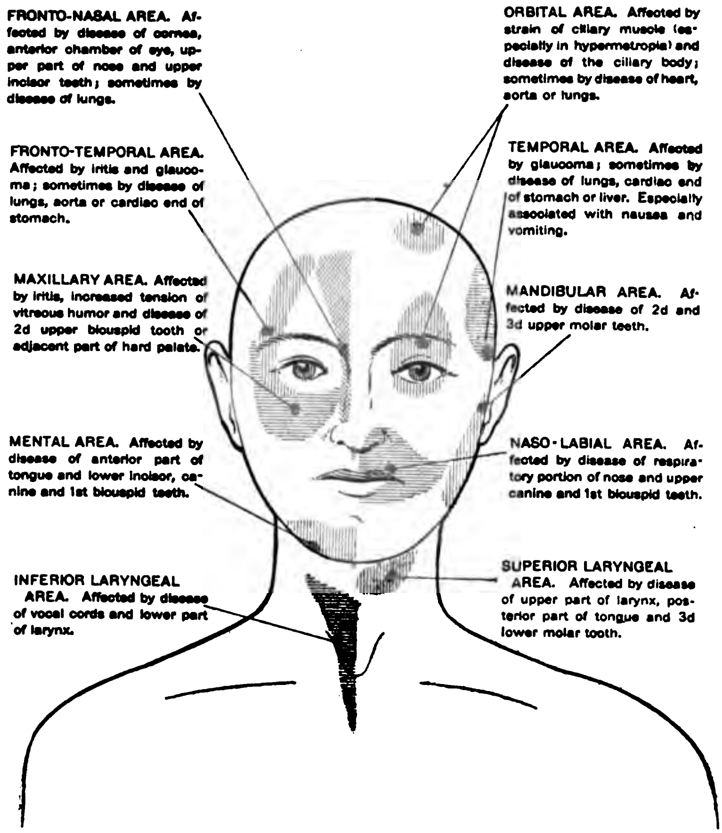
Local Significance.—**Pain in the head,** when continuous, dull, aching, and increased on lowering the head, may be due to rheumatism. When of like character and limited to the forehead, it may be dependent on gastric derangement or eye-strain. It is likely to be neuralgic when limited to one spot of the head or face, and darting from spot to spot and sharp and paroxysmal. When accompanied by nausea, vomiting, and giddiness, it is called migraine, but is probably due to eye-strain. Cerebra disturbance may be productive of like pains, but in this case they are continued for more than a day or two. The ophthalmoscope may help to differentiate here between migraine and cerebral trouble or Bright's disease. Tumor, aneurysm, abscess, hemorrhage, or meningitis are forms of intracranial disease accompanied by pain in the head, vomiting, giddiness, squint, or some other evidence of localized paralysis of a cranial nerve. A more or less variable amount of pain in the head will remain after recovery from hemiplegia. The pain in the head from Bright's disease is likely to attack the back of the head. The pain in the head from glycosuria is more or less continuous, with violent exacerbations. Generally speaking, persistent pain in the head, in one unaccustomed to it, should call for the use of the ophthalmoscope and urine analysis, particularly in females. Lead-poisoning may also be responsible for headaches. When chlorosis exists, the pain in the head is fixed in one spot, and is piercing. The pain of hysteria often simulates it. Pains in the head are often due to ocular disturbance other than abnormalities of refraction: as, for instance, weaknesses or imbalance of certain eye-muscles. The pains in the head in locomotor ataxia are of a darting, shooting character. See HEADACHE.

Pain in the neck may be due to rheumatism, which generally affects the large muscles; to uric acid excess, or some equivalent, which excites a subacute inflammation of severe type; to neuralgia; to caries of the spine; to rheumatoid arthritis of the cervical vertebræ; or to herpes zoster.

Pain in the chest may be referred to the chest-wall or to the interior of the cavities. When due to muscular rheumatism, syphilitic periostitis, intercostal neuralgia, or to the encroachment of aneurysm or tumor, the pain is probably superficial. The first cause would probably be indicated by an absence of febrile action and the dependence of the pain upon movement. Syphilitic periostitis would be distinguished by the finger outlining a node upon the clavicle, sternum, or ribs, and by the history or other symptoms. The character of the pain would indicate an intercostal neuralgia, especially when coupled with the history of previous neuralgic attacks in other portions of the body.

Physical examination will detect or exclude aneurysmal tumor. Pleurisy causes particularly well marked pain on coughing. It may be confounded with intercostal neuralgia or muscular rheumatism. Continued deep and dull pain in the chest points to intrathoracic growth, aneurysm, or abscess. See CHEST.

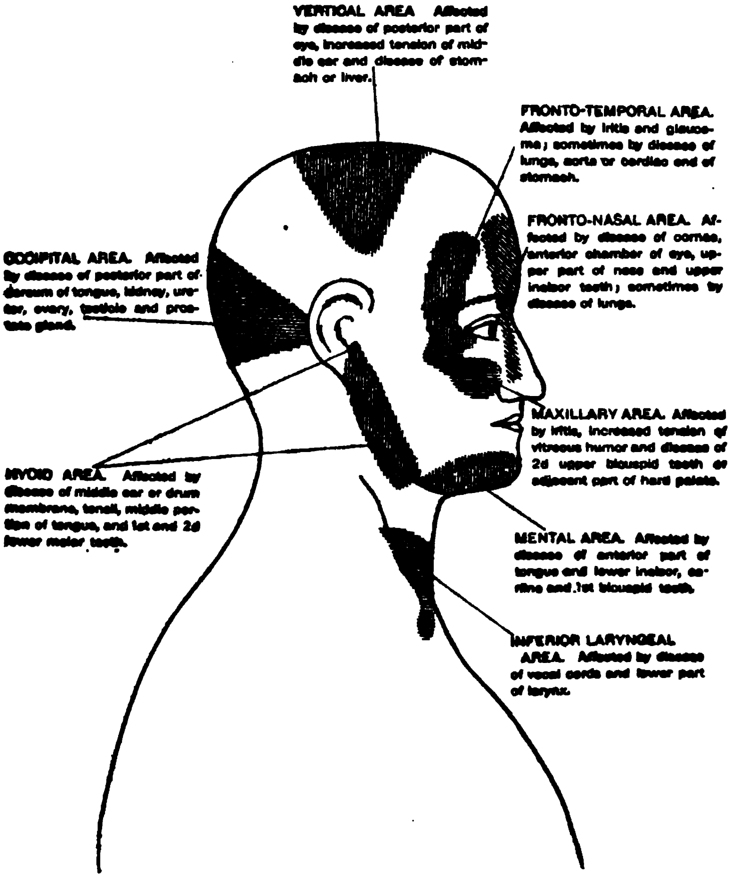
Pain about the heart may be caused by beginning pericarditis or endocarditis. Purely nervous debility is often attended by a dull and more or less constant pain about the heart, and cardiac palpitation and hysteria are often accompanied by a somewhat sharp pain just under the mamma. The pain of angina pectoris is not confined to the heart, but extends to the left arm and various parts of the chest. Pains in the chest also accompany the various diseases of the lungs and pulmonary tubes. See HEART (Pain).


FRONTO-NASAL AREA. Affected by disease of cornea, anterior chamber of eye, upper part of nose and upper incisor teeth; sometimes by disease of lungs.
FRONTO-TEMPORAL AREA. Affected by iritis and glaucoma; sometimes by disease of lungs, aorta or cardiac end of stomach.
MAXILLARY AREA. Affected by iritis, increased tension of vitreous humor and disease of 2d upper bicuspid tooth or adjacent part of hard palate.
MENTAL AREA. Affected by disease of anterior part of tongue and lower incisor, canine and 1st bicuspid teeth.
INFERIOR LARYNGEAL AREA. Affected by disease of vocal cords and lower part of larynx.
ORBITAL AREA. Affected by strain of ciliary muscle (especially in hypermetropia) and disease of the ciliary body; sometimes by disease of heart, aorta or lungs.
TEMPORAL AREA. Affected by glaucoma; sometimes by disease of lungs, cardiac end of stomach or liver. Especially associated with nausea and vomiting.
MANDIBULAR AREA. Affected by disease of 2d and 3d upper molar teeth.
NASO-LABIAL AREA. Affected by disease of respiratory portion of nose and upper canine and 1st bicuspid teeth.
SUPERIOR LARYNGEAL AREA. Affected by disease of upper part of larynx, posterior part of tongue and 3d lower molar tooth.

AREAS OF REFERRED PAIN.—(*From Head.*)

Pain in the spinal column is commonly indicative of a state of nervous exhaustion, rather than of disease of the spinal cord. Diseases of the cord do not usually give rise to such pain, unless attended by disease of the spinal vertebræ. Spinal meningitis gives pain only on movement. Myelitis is attended by an encircling pain—as of a band in the wall of the chest or abdomen—and when accompanied by a "bloated feeling," is a serious symptom. Aneurysm and malignant growth resemble this condition, but the pain in the two last instances is often constant and excessive, with a good deal of tenderness of the surface of the spine. A "stinging" pain of the chest is often complained of in beginning caries of the vertebræ. Heavy pressure on the spine will cause a like pain, and the acts of stooping, or of lifting weights, or of jumping to the ground will cause complaint of pain in the spinal column in this disease. See Locomotor Ataxia, Spinal Cord.

Pain in the abdomen may be in the wall or cavity. Inflammation, abscess, neuralgia, herpes, overstrain, or fatigue may be responsible for pain in the wall. Pain in the cavity of the abdomen may be dependent on internal strangulation of the bowel, strangulated hernia, peritonitis, the false pains of labor, enteritis, appendicitis, tympanites, fecal accumulations, colic, biliary or renal calculi, and on hysteria. See Abdomen (Pain).


VERTICAL AREA Affected by disease of posterior part of eye, increased tension of middle ear and disease of stomach or liver.
FRONTO-TEMPORAL AREA. Affected by iritis and glaucoma; sometimes by disease of lungs, aorta or cardiac end of stomach.
FRONTO-NASAL AREA. Affected by disease of cornea, anterior chamber of eye, upper part of nose and upper incisor teeth; sometimes by disease of lungs.
OCCIPITAL AREA. Affected by disease of posterior part of dorsum of tongue, kidney, ureter, ovary, testicle and prostate gland.
MAXILLARY AREA. Affected by iritis, increased tension of vitreous humor and disease of 2d upper bicuspid teeth or adjacent part of hard palate.
HYOID AREA. Affected by disease of middle ear or drum membrane, tonsil, middle portion of tongue, and 1st and 2d lower molar teeth.
MENTAL AREA. Affected by disease of anterior part of tongue and lower incisor, canine and 1st bicuspid teeth.
INFERIOR LARYNGEAL AREA. Affected by disease of vocal cords and lower part of larynx.

Areas of Referred Pain.—(*From Head.*)

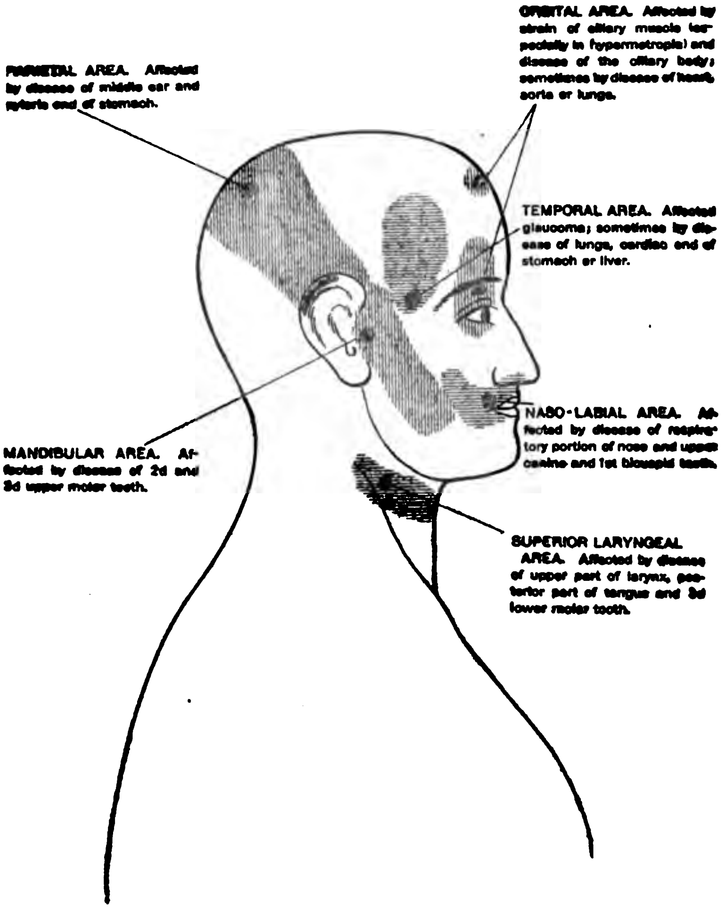
Pain in the loins and back may arise from congestion of the kidneys or nephritis, renal calculus, abscess or morbid growth, flatulent distention of the bowels or retained feces, tumor of the bowel, abscess of the rectum, an undiscovered hernia, flexions and morbid growths of the uterus, ulcerations of the cervix, the approach of the catamenial period, retention and overdistention of the bladder (which also gives pain in the hypogastric region), or to Lumbago (*q. v.*). Lumbago depends upon rheumatism of the muscles, or subacute inflammation of the connective tissue between the muscles. When the pain in the back is stabbing, paroxysmal, or independent of muscular movement, it is probably neuralgic in character. Contrary to the popular idea, chronic nephritis is not usually associated with pain over the kidneys.

Pain in the extremities may be due to neuralgia. When paroxysmal in character—sudden, sharp, lightning-like, darting through one or more limbs and severe enough to make one cry out—the pains are probably due to the early stage of locomotor ataxia. They will occur in paroxysms, lasting hours, days, or weeks, and subside as quickly as they came. Rheumatic pains, gnawing and aching pains occupying the joints in acute inflammations, also affect the extremities.

The treatment of pain is always primarily directed to its causation. As a rule, pain should be relieved temporarily, since its continuance is exhausting and mischievous to the nervous system. However, when it constitutes a vital point in diagnosis, the administration of narcotics is ill-advised. Rest is essential, while local applications, as counterirritants, poultices, sinapisms, or anodyne liniments are most ready means in many cases. Superficial pain is often relieved by a plaster or extemporaneous liniments containing laudanum or some other fluid preparation. The oleate of morphin alone is said to be penetrating, but it is doubtful whether such applications are of direct value. Intense pain, as from the passage of a calculus, is best treated by the hypodermic injection of morphin sulphate (1/4 to 1/2 grain) with atropin sulphate (1/100 grain), while the preparations of opium may be given by the mouth for the same purposes. Severe pain enables the system to resist the action of opium. Opium is the most efficient and universally used drug for relieving pain, and morphin is its most analgesic alkaloid. A single injection is sometimes curative in sciatica and other neuralgias. In combination with antipyrin it is more efficient than when used alone. Codein is another opium derivative, having special action over abdominal and ovarian pain, and is not liable to give rise to the drug-habit.

The treatment of inflammatory pains is that of the inflammation itself, and, hence, often different from, if not the reverse of, the treatment of other kinds of pain. The first indication is rest, including the position which assures most complete rest

After rheumatic carditis the patient had better stay in bed 3 or 4 months if he still has cardiac pains and a quickened pulse. Nothing is more serviceable sometimes in the later stages of pleurisy than to limit, as much as possible, the movements of the ribs by firmly strapping the whole affected side of the chest. But the instances in which this principle can be applied are too numerous to mention here. In many acute inflammations the vascular sedative action of topical blood-letting is often remarkably effective in relieving the pain. On the other hand, with the pains of chronic inflammations the stimulant effect of counter-irritation is preferable, according to the rule that the indications in the treatment of chronic inflammations are the opposite of those for acute inflammations. In traumatic lesions both the pain and the inflammation are generally treated best by local application of ice-bags, but cold is useless when the inflammation is due to a general cause in the blood, as in rheumatic and gouty arthritis. Cold applications should be discontinued at once if they cause a neuralgic pain to take the place of an inflammatory pain. Many internal inflammatory pains are best relieved by the sedative properties of moist heat applied to the surface, as by poultices, etc., according to the general law that the cutaneous sensory nerves are always in association with the vascular nerves of the parts underneath. The best drug for inflammatory pain is opium. Next comes aconite, especially in serous membrane and cardiac inflammations. The coal-tar analgesics, so valuable in the other kinds of pain, are comparatively useless in inflammatory pains.


PARIETAL AREA. Affected by disease of middle ear and pyloric end of stomach.
ORBITAL AREA. Affected by strain of ciliary muscle (especially in hypermetropia) and disease of the ciliary body; sometimes by disease of heart, aorta or lungs.
TEMPORAL AREA. Affected glaucoma; sometimes by disease of lungs, cardiac end of stomach or liver.
NASO-LABIAL AREA. Affected by disease of respiratory portion of nose and upper canine and 1st bicuspid teeth.
MANDIBULAR AREA. Affected by disease of 2d and 3d upper molar teeth.
SUPERIOR LARYNGEAL AREA. Affected by disease of upper part of larynx, posterior part of tongue and 3d lower molar tooth.

Areas of Referred Pain.—(*From Head.*)

The following list, taken from Potter's "Therapeutics, Materia Medica and Pharmacy," contains the agents most employed in the treatment of pain: **Opium** is the most efficient of all analgesics and is universally used to relieve pain from any cause except acute inflammation of the brain; opiates soon lose their power in any particular dose, and require increasing dosage to sustain their analgesic influence, hence in chronic cases all other means should be exhausted before resorting to them. **Morphin** is the most analgesic alkaloid of opium; hypodermically in the vicinity of the nerve it is efficient when not so by the stomach; the morphin-habit must be kept in mind; a single injection thereof is sometimes curative in sciatica and other neuralgias; the conjoined administration of morphin and antipyrin is much more efficient in pain than the use of either agent alone. **Codein** has a special influence over abdominal pain and that of the ovaries, and is not liable to give rise to a drug habit. **Dionin** in 4 to 7 percent solution locally is the best analgesic for the eye. **Belladonna** is the best remedy for every kind of pain in the pelvic viscera. **Atropin,** hypodermically in local pain, neuralgia, sciatica, glaucoma; when it succeeds, has more lasting effect than morphin; for sciatica, tic douloureux; has little value unless the pain be due to spasm or some cause situated so that the remedy can be brought into direct contact with sensory nerve-endings. **Duboisin** may be used instead of atropin. **Cocain,** as a local anesthetic to mucous surfaces, or hypodermically for minor operations involving a small area, as circumcision, eye operations, has no equal; a 4 percent solution is generally employed; also as a general anesthetic by spinal subarachnoid injection. **Eucain** is fully as efficient as cocain and much less toxic; in medicinal doses is harmless and does not affect the heart. **Antipyrin** is a most efficient analgesic in doses of 10 to 15 grains, being especially adapted to neuralgia, migraine and the pains of gouty and rheumatic origin, but is of no value in pain due to a local inflammation; it may be used hypodermically. **Acetanilid** is highly efficient in doses of 4 to 7 grains for the pains of locomotor ataxia and those of rheumatic origin, also locally as a dry dressing for painful wounds, ulcers, etc.; it is the active ingredient in a host of recent proprietary remedies against pain. **Acetphenetidin,** efficient in 10-grain doses, for neuralgia, hemicrania; is largely used for the relief of pains of the character for which antipyrin is employed. **Phenocoll hydrochlorid,** in doses of 12 to 15 grains, is a good analgesic in the neuralgic pains of influenza, and in gouty and rheumatic pain. **Lactophenin** is analgesic and nontoxic; a feeling of comfort follows its use. **Chloroform** by inhalation as a general anesthetic; internally for the pain of colic, even that of lead colic, and externally as liniment with other substances for chronic neuralgic or rheumatic pains; the vapor to the raw surface of cancers, to the photophobic eye, etc. **Ether** as spray for local anesthesia, by inhalation for general anesthesia; anesthetics should be

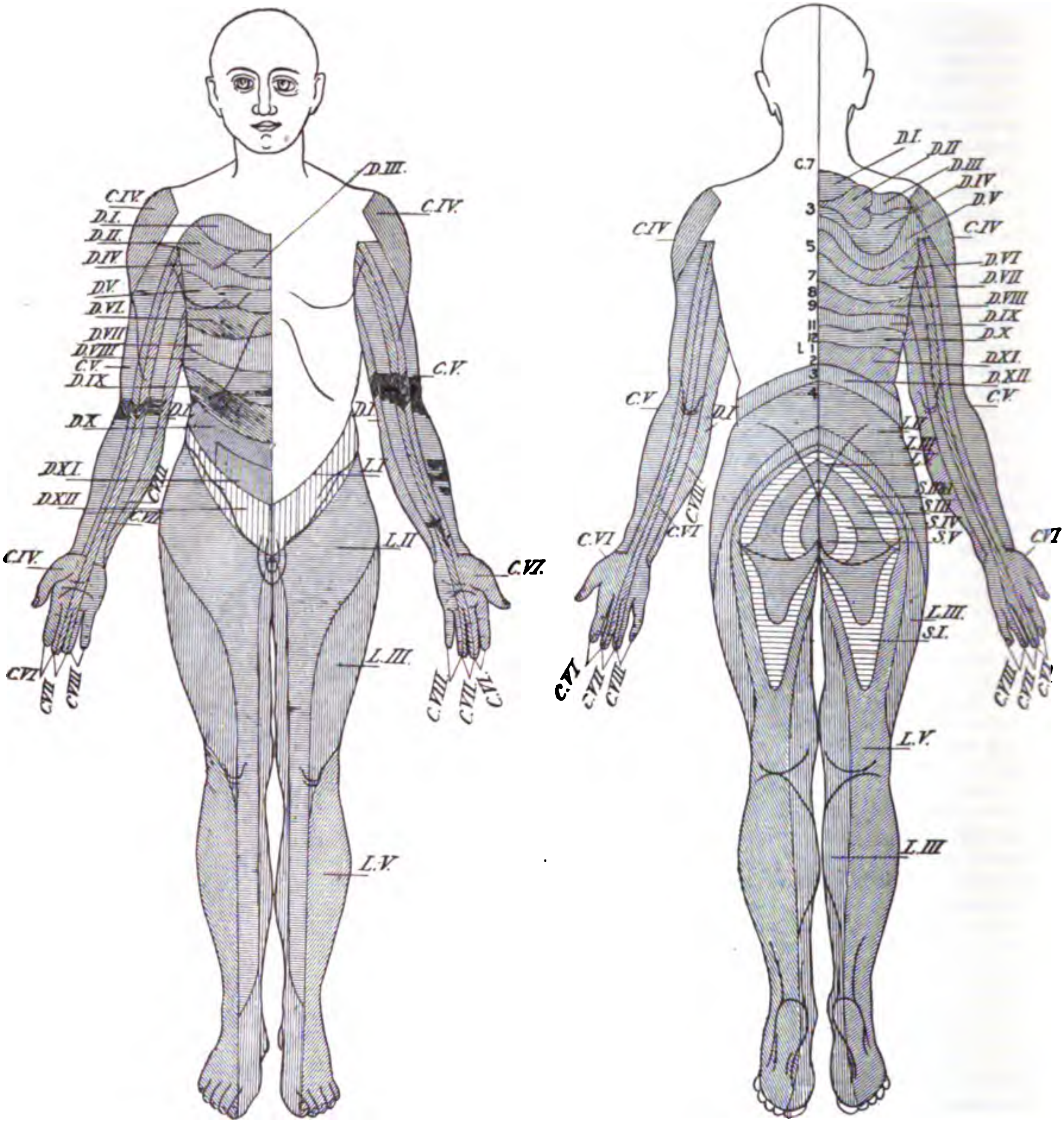


Diagram of Skin Areas Corresponding to Different Spinal Segments.—*(From Tyson, Starr and Head.)*

employed only when pain is exceedingly severe and transient. **Hydrated chloral** is analgesic only in large and dangerous doses; sometimes relieves neuralgia, chronic rheumatic pains, colic, gastralgia, etc. **Aconite** was formerly much used for neuralgic pain; aconitin locally is one of the most certain and powerful palliatives in neuralgic, rheumatic and gouty pains; especially in trigeminal neuralgia. **Veratrin** as ointment locally for neuralgia, is readily absorbed through the skin and is more dangerous than useful. **Guaiacol,** locally or by hypodermic injection, 1 part in 10 of olive oil, or mixed with equal part of glycerin for painting on the surface, is an efficient local anesthetic, and is used successfully in orchitis, in neuralgic pains of tuberculous subjects, also in sciatica and rheumatism; a few drops rubbed in gently give immediate relief in many superficial pains, also in labor-pains. **Phenol** pure, is a local anesthetic, but has been supplanted by cocain. **Creosote** locally is efficient for the pain of an exposed dental nerve. **Ichthyol** locally is analgesic against inflammatory pain; hypodermically is analgesic, less so than morphin and less dangerous. **Amyl nitrite,** also nitroglycerin and other nitrites, are effective usually against cardiac pain; especially when arterial spasm exists as in angina pectoris. **Cannabis indica** is inferior to opium, but may be tried when the latter is contraindicated for any reason. **Salicylates** are efficient in rheumatic and gouty pain, also in rheumatic neuritis. **Mesotan** locally for superficial rheumatic pain. **Iodoform** in suppository for painful disease of the rectum or bladder; as a local analgesic in painful ulcers, hemorrhoids, anal fissures, etc. **Iodids** are magical for syphilitic nocturnal pains of the head; ammonium iodid (3 grains in 1 ounce of olive oil), with friction causes the disappearance of nocturnal syphilitic pains. **Cimicifuga** relieves many kinds of pain, as neuralgia of fifth cranial nerve, rheumatic headaches, ovarian neuralgia, dysmenorrhea; inferior to ergot in labor-pains or after-pains; ʒ j doses of the tincture. **Conium,** in cancer, rheumatism, neuralgia, ovarian pain; also for the fulgurant pains of locomotor ataxia, chronic alcoholism, sciatica, phthisis, doses of ♏ x of a fluidextract of the unripe fruit every 1/2 hour, well watched. **Iron,** with belladonna, for the wandering pains of anemia, in which morphin is dangerous and bromids are useless. **Oil of peppermint** locally is sometimes very effective in relieving pain; has been long used in China for neuralgia and subacute rheumatism. **Menthol** freely rubbed on for superficial neuralgic pain of peripheral origin. **Rhatany** relieves the pain of ulcers, burns, and blisters. **Methylene-blue** relieves neuralgic and rheumatic pains; has some analgesic action, but is uncertain, and has no advantage over the newer anilin derivatives. **Electricity,** the galvanic current for neuralgia; it is powerless against pain of phlegmonous inflammations; galvanism of the affected nerve gives certain relief; the positive pole on point of emergence, negative over superior ganglion of cervical sympathetic. **Heat,** if pain is without fever or inflammation, warm injections soothe the pain of cystitis, prostatitis and abdominal pains generally. **Hot water,** as bath, relieves pain most wonderfully; **cold,** when pain is inflammatory in origin. **Phototherapy,** the ultra-violet rays are very effective in relieving acute muscular pain, especially if obtained with iron-carbon electrodes.

ORGAN DISEASED.	SPINAL SEGMENTS WHOSE SENSORY AREAS ARE PAINFUL.	CRANIAL AREAS IN WHICH PAIN MAY ALSO BE FELT.
Heart	1, 2, 3 dorsal (angina pectoris).	Orbital.
Lungs	3, 4 cervical, 1, 2, 3, 4, 5 dorsal.	Frontonasal, orbital, frontotemporal, temporal.
Ascending aorta	1, 2, 3, 4 dorsal	Orbital, frontotemporal.
Arch of aorta	5, 6 dorsal	Frontotemporal.
Stomach, cardiac	6, 7 dorsal	Frontotemp., temporal.
Stomach, pyloric	8, 9 dorsal	Vertical, parietal.
Liver and appendages.	7, 8, 9, 10 dorsal	Temporal, vertical, parietal, occipital.
Intestine	9, 10, 11, 12 dorsal.	Parietal occipital
Kidney and ureter	10, 11, 12 dorsal	Occipital.
Prostate	10, 11, 12 dorsal, 5 lumbar, 1, 2, 3 sacral.	Occipital.
Ovary or testicle	10 dorsal	Occipital.
Rectum	2, 3, 4 sacral	
Epididymis	11, 12 dorsal	
Oviduct	11, 12 dorsal, 1 lumbar.	
Bladder, mucous membrane and neck.	1, 2, 3, 4 sacral	
Bladder, over-distention and ineffectual contraction.	11, 12 dorsal, 1 lumbar.	
Uterus, in contraction.	10, 11, 12 dorsal, 1 lumbar.	
Uterus, os	1, 2, 3, 4 sacral (5 lumbar very rarely).	

PALATE, DISEASES.—The affections of the palate are mostly surgical. The diseases of the palate are: (1) Congenital malformations; (2) inflammation; (3) ulcers; (4) necrosis; and (5) tumors.

Congenital malformations (see CLEFT PALATE) may be simple or phlegmonous, of the soft parts, or involve the hard palate, affecting the periosteum and bone.

Ulcers.—The principal forms of ulceration are those of syphilitic, tuberculous, or epitheliomatous origin. Injury gives rise to simple ulcers, which present no special feature of interest. Syphilitic ulcers are common, in the early secondary stages of the disease being superficial, while deep ulcers occur in the tertiary stage and appear late—5 to 8 years after the primary lesion. They are generally single, have the usual characters, and may spread to the base of the cranium. Tubercular ulcers, most usual in childhood, are associated with tubercular disease elsewhere. Small tubercles, projecting slightly above the surface, first appear, break down the erosions, coalesce into irregular ulcers of little depth, with festooned borders and a yellowish base covered with pale granulations. They may become serpiginous. Epitheliomatous ulcers are rare.

Tumors.—The glandular tumor is the most common. It is often found on the hard palate, is usually soft and elastic to the touch, painless, and causes no symptoms beyond the encroachment upon the buccal cavity. Erectile tumors are confined to the hard palate. Papilloma is infrequent and sarcoma is rare. Epithelioma rarely develops primarily in the soft palate. Cysts—mucous and dermoid—fibroma, enchondroma and osteoma, myxoma, lipoma and adenoma, and tumor growths of the palate, while inflammatory, and tubercular and gummatous swellings occur.

Treatment of diseases of the palate must, as a rule, be directed to the particular disease affecting the palate in common with other adjacent structures. Local antiseptic, astringent, and caustic treatment is of value. Surgical operations are often of the greatest service.

PALMAR ABSCESS.—See HAND.

PALPITATION.—Any spasmodic fluttering or tremor, especially the abnormally rapid beating, of the heart, of which the person is conscious. It is often associated with a choking sensation in the throat. It may be due to organic disease or to functional disturbance of the heart; very often it is caused by disorders of the stomach. See HEART-DISEASE (Functional).

PALSY.—See PARALYSIS.

PANCREAS, DISEASES. Relations of Pancreas.—The pancreas is a compound racemose gland, consisting of a broad, slightly curved portion called the head, while the left extremity terminates in a pointed end denominated the tail, and the middle portion forms the body. The pancreas is from 6 to 8 inches in length, extending transversely across the posterior wall of the abdomen, occupying the epigastric and left hypochondriac regions. The head of the pancreas is in close relation with the duodenum and common bile-duct, the body being covered by the posterior wall of the stomach and the transverse colon, while the tail is placed over the left kidney and impinges upon the concave border of the spleen.

Pancreatic Apoplexy.—Hemorrhage into the pancreas is generally the result of venous engorgement, traumatism, or atheromatous condition of the blood-vessels. The hemorrhage may be excessive, producing a rapid enlargement of the organ, with sudden pain, great tenderness, and a sense of fulness in the affected region, and accompanied by vomiting, paleness of the face, cold extremities, rapid and feeble pulse, and evident symptoms of sudden collapse. Death usually occurs within from 3 to 7 days.

Acute Pancreatitis.—Acute inflammation of the pancreas.

Etiology.—Septic infection through the medium of the pancreatic ducts, caused by such organisms as the colon bacillus, pyogenic cocci, typhoid bacillus, etc. See COLON BACILLUS INFECTION.

Pathology.—The pancreas is enlarged from excessive amount of blood in the part, and the infiltration of the tissues with red blood-cells and leukocytes. In some cases the process is a rapid one, leading to fatty degeneration, giving rise to abscess (suppurative pancreatitis) or gangrene (gangrenous pancreatitis).

Symptoms and Clinical Course.—In acute inflammation of the pancreas the onset is marked by tenderness in the region of the pancreas, enlargement of the organ, slight fever, vomiting, and gastric distress.

If the process is a suppurative one, or if gangrene supervenes, all the symptoms become more pronounced, with sweat and chills, paleness of face, cold extremities, rise of temperature at first, then sudden decline, with evident symptoms of collapse. In the latter forms death usually occurs within 4 to 6 days.

Prognosis is unfavorable.

Treatment is the same as that for PERITONITIS (*q. v.*).

Chronic interstitial pancreatitis may be the result of cholelithiasis or biliary obstruction, or of the simple form of hemorrhagic pancreatitis. The resulting sclerosis then causes constriction of the common bile-duct and so gives rise to jaundice and a variable distention of the gall-bladder, accompanied by wasting and paroxysmal attacks of pain and ague-like seizures. The pulse may then be rapid, and so differs from the pulse in ordinary jaundice. If such symptoms arise in patients under forty, chronic interstitial pancreatitis may be suspected, since cancer of the head of the pancreas is rare until after that age. A hard lump may be felt in the region of the head of the pancreas, and if there is also fat in the feces, sugar in the urine, and bronzing of the skin, a diagnosis may be arrived at. A special test for glycerin products of fat decomposition by Dr. Cammidge should give a positive reaction. The treatment is cholecystenterostomy together with the removal of any gall-stones met with. The result may be a good and lasting recovery. Some cases of pancreatic diabetes appear to have been secondary to this form of chronic pancreatitis, and the possibility of warding off diabetes is a further recommendation for cholecystenterostomy.

The Cammidge reaction in the diagnosis of pancreatic disease, while it is not pathognomonic, is believed by many authorities to be highly suggestive.

Technic of the Improved Method.—A 24 hour specimen of urine must be freed from albumin and sugar. To 40 c.c. of filtered acid urine are added 2 c.c. of concentrated hydrochloric acid and the mixture is boiled 10 minutes, cooled and to it added water up to 40 c.c., then also 8 grams of lead carbonate and it is then cooled again. After filtering the filtrate is treated with 8 grams of tribasic lead acetate to remove the glycosuric acid. The precipitate is removed by filtering and to the filtrate is added 4 grams of powdered sodium sulphate, the mixture heated to the boiling-point, then cooled and carefully filtered. To 10 c.c. of the filtrate made up in a flask to 17 c.c. with distilled water, are added 0.8 gram of phenyl hydrazin hydrochlorid, 2 grams of sodium acetate and 1 c.c. of 50 percent acetic acid and the mixture boiled 10 minutes. While hot it is filtered and the filtrate made up to 15 c.c. with hot water and allowed to stand. In several hours a yellow precipitate forms which is observed under the microscope to consist of yellow crystals arranged in sheaves and rosettes.

Carcinoma of the Pancreas.—The disease is usually primary and of the scirrhous variety. The seat is usually at the head of the organ. It may be secondary to carcinoma elsewhere, as in the stomach or intestines.

Pathology.—The carcinomatous infiltration invades the tissues of the organ; there is great multiplication of cells, which become packed together and form dense nodules. If the process continues, the common bile-duct becomes occluded from the pressure, and jaundice follows. Metastasis may occur, and the process extend to the duodenum, liver, stomach, or peritoneum.

Symptoms and Clinical Course.—Jaundice, tenderness in the epigastric region, and the presence of a nodular immovable tumor are the three most common symptoms. Together with these symptoms there are fever, emaciation, fatty or greasy stools, and often glucose in the urine.

Diagnosis.—From cancer of the stomach it may be distinguished by the fact that if the stomach is involved, the tumor is more superficial, is movable, and there is hematemesis and absence of free hydrochloric acid in the gastric contents one hour after a test-breakfast. In aneurysm of the aorta the tumor is not lifted up and down with each pulsation, as in cancer of pancreas, and in the former there is a thrill on palpation, a bruit sound on auscultation, and jaundice is absent.

Prognosis.—The disease is always fatal.

Treatment is merely palliative. The diet may be the same as that used in cancer and ulcer of the stomach.

Cysts of the Pancreas.—These are usually retention cysts, the result of impaction of calculi in the pancreatic ducts. These cysts may attain considerable size.

Symptoms and Clinical Course.—There is a slightly movable tumor in the left side of the epigastric region, containing a brownish or chocolate-colored fluid. Occasional attacks of colic and fatty stools may help distinguish the disease, although a diagnosis is often impossible.

Treatment is purely surgical.

PANCREATIC EXTRACT.—The pancreas, both in substance and extract, has been administered as a remedy for diabetes, but the results have been negative. A few instances are recorded in which its use was followed by some temporary amelioration of the symptoms of the disease. See ORGANOTHERAPY.

PANCREATIN.—A mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog, or the ox, and consisting principally of amylopsin, trypsin, and steapsin; and proved to be capable of converting not less than 25 times its own weight of starch into substances soluble in water. Dose, 3 to 15 grains.

Pancreatin digests albuminoids and converts starch into sugar and proteids into peptones, also emulsifies fats in the presence of an alkaline solution. Prolonged contact with mineral acids renders it inert. It is digested by pepsin, and hence probably never passes into the duodenum in its own character. Pancreatin is used to partially digest (peptonize) milk, gruel, soups, and other foods, before their administration in cases of great digestive debility. These peptonized foods may be administered by the stomach or the rectum, and are valuable in intestinal dyspepsia, wasting diseases, and convalescence from acute affections. See also ORGANOTHERAPY.

PANNUS.—Vascularization of the cornea, usually due to the irritation of trachoma granulations. See CORNEA (Diseases), TRACHOMA.

PANOPHTHALMITIS.—Inflammation of all the tissues of the eyeball. It is a purulent iridochoroiditis resulting in abscess formation. There is protrusion of the eyeball and perforation of the coats.

PAPAIN.—A proteolytic ferment obtained from papaw-milk, the juice of *Carica papaya*, a tree native to South America. It has the digestive properties of pepsin, but is far more active, dissolving fibrin in neutral, acid, or alkaline liquids. It is an excellent solvent of false membranes. *Papayotin* and *caricin* are other names for the ferment. Dose, 1 to 3 grains.

PAPAVER.—The poppy, the juice and extracts of which possess narcotic properties. Opium is obtained from *P. somniferum*. See OPIUM.

PAPAVERIN.—An alkaloid found in opium. It is narcotic, and produces primarily muscular relaxation; later, convulsions. It stands midway between morphin and codein in its action on the central nervous system, but it is a comparatively weak poison.

PAPAW.—See PAPAIN.

PAPAYOTIN.—See PAPAIN.

PAPER.—Paper has been introduced into surgery as a substitute for lint on account of its cheapness. Porous varieties resembling blotting paper, and capable of absorbing a large amount of fluids, have been manufactured; hence, it is suitable for applying wet dressings, as lead-water and laudanum, etc. When once saturated, owing to its friable character, it cannot be reapplied. Waxed paper, made by immersing sheets of tissue paper in hot wax or paraffin, which, when cooled, forms a thin coating that makes it impervious to water is universally employed in hospital practice as a subtitute for oiled silk; owing to its cheapness it can be destroyed after each application. Because of its extreme thinness it is advisable to use several layers, otherwise the moisture soon makes its way through. Parchment paper has been introduced as a substitute for mackintosh in the Lister antiseptic gauze dressing. When first removed from the package, it is soft and pliable, but on drying becomes crisp. The paper, when applied over wet dressings to prevent the escape of moisture, appears to fulfil all purposes for which oiled silk has served.

Paraffin paper is employed as a dressing in some forms of skin-disease accompanied by crusting and exfoliation, with the object in view of macerating the skin and thus loosening the products of disease. In other cases it is employed as a protector. Paper is valuable in applying ointments and moist dressings. It is superior to rags and cloths. The paper is to be cut into pieces of the appropriate size, spread with the selected ointment, and closely applied to the surface, being kept in place by a bandage. In affections of the fingers and toes, as well as the limbs generally, paraffin paper is easily adapted to the inequalities of the skin surfaces. The fact that it soon becomes friable and torn is an advantage, as it insures more frequent change of dressings, and consequent cleanliness.

Blotting paper rolled between the fingers and introduced into the nostrils is recommended by Sajous for removal of secretion from nasal passages in young children. It has been suggested also as a material for making tampons for arresting nasal hemorrhage.

Before soaking in a solution of nitrate of potash, paper should be cut in strips 3 inches long by 1/2 inch broad. It is next dipped in the solution in a cylindric vessel 4 inches high and 2 inches in diameter. The paper should then be ignited and the smoke inhaled by repeated deep inhalations. Nitrated papers, according to Lefferts, should be kept in tin-foil or prepared in small quantities, as required. See Potassium Nitrate, Chartæ.

PAPILLITIS.—Inflammation of the optic disc or papilla of the eye. The old terms, choked disc, descending neuritis, etc., implied unproved theories of causation, and have been replaced by the adoption of the better term, papillitis. Intracranial diseases, as tumors, meningitis, abscess, etc., are the most frequent causes. See Optic Neuritis.

PAPILLOMA.—A term loosely employed to include corns, warts, horns, and certain nævi. Papillomata stand midway between true tumors and inflammatory growths; a papilloma is any growth on the skin or mucous membrane based upon, or resembling, a normal papilla. A hard papilloma is a form in which the connective-tissue framework is denser and the cells fewer than usual. It grows chiefly from the skin. A soft papilloma is one growing from mucous membranes, especially in the uterus, rectum, and bladder. See Corn, Tumors, Warts.

PAQUELIN CAUTERY.—See Cautery.

PARACENTESIS.—Piercing or tapping a cavity of the body, such as the chambers of the eye, the membrana tympani, the abdomen, or the thorax, for the evacuation of fluid. See Ascites, Cornea (Operation), Ear, Pericarditis.

PARADOXIC CONTRACTION.—See Nervous Diseases (Examination).

PARALDEHYD. $C_6H_{12}O_2$.—A polymeric form of acetaldehyd. It is a colorless liquid of repulsive odor and unpleasant taste. It is a reliable hypnotic, and is diuretic. It is valuable in delirium tremens, mania, tetanus, and other nervous affections. Dose, 20 minims to 2 drams. It will dissolve trional, and this solution forms a powerful hypnotic.

Paraldehyd Habit.—The morbid addiction to the use of the drug gives rise to symptoms similar to delirium tremens. Emaciation, anemia, weakness and irregularity of the action of the heart, gastric derangement, costiveness, general tremulousness, especially in the tongue, facial muscles, and hands, feebleness and unsteadiness of gait, general restlessness, paresthesia, insomnia, mental anxiety and agitation, mental confusion, mental excitement, temporary loss of memory, incoherence of speech, hallucinations, delusions. The odor of paraldehyd may be appreciable in the breath. Treatment requires about 3 months in an inebriate asylum.

PARALYSIS.—Loss of the power of voluntary motion. **Paresis** is simple weakening of such motor power.

By **monoplegia** is meant isolated paralysis of one part of the body, as an arm or leg. By **hemiplegia** is meant paralysis of the entire half of the body, including half of the face, one arm, and one leg, also known as unilateral paralysis. By **paraplegia** is meant simultaneous paralysis of corresponding halves of the body. Paralysis of the two arms is spoken of as **superior paraplegia,** of the two legs as **inferior paraplegia,** while the word paraplegia alone is often used for the latter condition. **Diplegia** is paralysis with spasm of all the extremities.

Impairment of voluntary muscular power must be the result of structural change in the motor area of the cortex, in the great motor tract of the brain or cord, or impairment in the integrity of the efferent nerves, or it may be more rarely, in the muscle itself, "myopathic palsy;" or the power of the will may be abrogated. In diseases of the peripheral nerves, when the paralysis is called peripheral, it is limited to the region of distribution of the affected nerves, whether one or many. It may be said in general that hemiplegia is the usual form of cerebral paralysis, while paraplegia is the expression of spinal paralysis. Monoplegias are usually due to lesions of the cortex or are peripheral palsies.

In all hemiplegias caused by lesions above the pons, the palsy, including face and extremities, is on the side opposite the lesion, but in most lesions in the pons there is **crossed paralysis**—that is, there is paralysis of the extremities on one side and of the face on the other side, because the fibers of the facial nerve cross much higher than the fibers to the extremities. The result is a paralysis of the face on the same side with the lesion, and of the extremities on the other. If the lesion is higher up, above the decussation of both the facial and pyramidal tracts, the paralysis is on the side opposite the lesion, in both face and extremities. Other nerves may substitute the facial in this crossed paralysis, as the hypoglossal or abducens. In rarer instances there may be lesion at the very decussation of the pyramid, cutting the motor fibers of one extremity before they cross, and those of another after crossing, producing the very rare condition of paralysis of an arm on one side and leg on the other (Tyson). See Brain, Muscles, Nerves, Spinal Cord.

PARALYSIS, ACUTE ASCENDING (Landry's Paralysis).—A rare disease characterized by paralysis appearing suddenly in the feet and ascending rapidly to the other muscles of the body, and finally involving the medulla. The paralysis is ordinarily preceded by a prodrome including anorexia, malaise, fever, pain in the head and back and tingling in the extremities. There are no pain and no trophic changes; the knee-jerk is usually diminished; sensation is generally preserved, but there may be hyperesthesia and muscular tenderness; the special senses are unaffected; the sphincters are uninvolved. The spleen may be enlarged. The paralysis is a flaccid one, the muscles are relaxed but do not atrophy or yield reactions of degeneration because of the rapidly fatal termination. The pathology is obscure, and the malady is a very fatal one, usually terminating in death within a week, although it may continue for 3 or 4 weeks. Recovery, however, has occurred in some cases. Males are more frequently attacked than females, and the affection occurs chiefly between the ages of 20 and 40 years.

Diagnosis.—Acute myelitis is distinguished from Landry's paralysis by the wasting, anesthesia, electrical changes, early involvement of the sphincters. In multiple neuritis there are marked sensory disturbances.

Treatment.—Rest in bed is essential. Dry or wet cups should be applied to the spine and counter-irritation kept up by a mustard plaster. Paquelin's cautery may be tried. Ergotin (10 to 20 grains a day), salicylates, perchlorid of iron, iodid of mercury, are all recommended.

PARALYSIS AGITANS (Shaking Palsy; Parkinson's Disease).—An affection marked by tremor or alternate contraction and relaxation of the muscles of the part involved.

Symptoms.—The movements are regular and rhythmic (in distinction from insular sclerosis), and begin usually in one hand. They almost never affect the head. They persist during rest, and are little influenced by voluntary movement. Later in the disease there is a typical gait, known as *festination* or *propulsion*. It consists in a progressive increase in the rapidity of the gait until the patient breaks into a run, which grows faster and faster until he either falls or seizes some support. This peculiar gait is ascribed to the bent position of the trunk, which throws the head so far forward as to bring the center of gravity beyond the line of the feet. Rarely the movement is backward: this is called *retropulsion*. It may be to one or the other side—*lateropulsion*. The speech is slow, monotonous, and high-pitched. The face is fixed and expressionless. In advanced stages there is an almost statue-like rigidity of the body. The hand assumes a peculiar position, as if rolling a small body between the thumb and the fingers, but later the position becomes constant, similar to that in which the pen is held—hence, the term of *writing hand*. The knee-jerk may be exaggerated. Flushing and heat are sometimes complained of. Paralysis agitans is most common in males over 40 years of age.

Diagnosis.—*Disseminated sclerosis* exhibits a tremor, but only of voluntary movements—intention tremor. There are also scanning speech and ataxic gait, with mental enfeeblement, as shown by an unnatural contentment with the physical condition and surroundings.

Chorea displays a tremor, but the movements are general, and particularly involving the muscles of the face. Again, chorea is a disease of children and young adults. See CHOREA.

The course is of long duration, the disease at times lasting 20 or 30 years.

The lesion is probably a diffuse sclerosis of the brain and spinal cord.

Treatment.—The patient should receive rest, bodily and mental. Nutritious food, cod-liver oil, hypophosphites, or arsenic should be administered. Hyoscyamin sulphate, 1/30 to 1/10 grain, 3 times daily, is a valuable remedy. Good results have followed the use of hyoscin hydrobromid, 1/200 to 1/100 grain, 3 times daily. Mild galvanism, 2 or 3 times a week, acts as a nerve-stimulant.

PARALYSIS, BELL'S.—See FACIAL PARALYSIS.

PARALYSIS, BULBAR, ACUTE.—This paralysis is the result of hemorrhage into the medulla or pons, or of thrombosis or embolism of the vessels supplying these centers. The symptoms are sudden; in addition to those of the progressive or chronic type there may be loss of consciousness, deranged cardiac and respiratory action, high fever. If the motor tract is involved there is the peculiar crossed paralysis that usually accompanies hemorrhage into the pons—paralysis of the face on one side and of the extremities on the other.

PARALYSIS, BULBAR, ASTHENIC (Erb's Disease, Myasthenia Gravis, Hoppe-Goldflam Symptom Complex).—A chronic disease characterized by progressive loss of muscular power affecting first the muscles of the eye, face, neck, tongue, larynx. The muscles involved become rapidly fatigued on effort, but regain power temporarily after rest. A similar effect obtains on faradization of the muscles (Jolly's myasthenic reaction).

Treatment consists in prolonged rest, massage, galvanization of muscles, liquid food, tonics.

PARALYSIS, BULBAR, PROGRESSIVE (Glosso-labiolaryngeal Paralysis, Atrophic Bulbar Paralysis).—A form of paralysis due to a degeneration of the nuclei of origin of the nerves (facial, glossopharyngeal, vagus, spinal accessory, and hypoglossal) arising in the oblongata. Bulbar symptoms may precede or follow spinal symptoms. A similar condition affecting the eye muscles is called progressive ophthalmoplegia.

Etiology.—The condition is sometimes a sequel to exposure to severe cold; it may be caused by morbid growths or by syphilis. Rheumatism, gout, and neck traumatisms are also causes.

It is usually confined to the latter half of life, and its prognosis is bad.

Symptoms.—At first only the muscles of the lips, tongue, and pharynx are affected. The disease is marked by difficulty in mastication, deglutition, respiration, phonation, and articulation, and by wasting of the muscles concerned in the performance of these functions.

Treatment is entirely symptomatic. Galvanism is the most promising remedy. Stabile applications, the electrodes on the mastoid processes and in the opposite direction, galvanization of the sympathetic, and applications to the lips, tongue, and fauces should be persistently used. Antisyphilitic remedies should be administered in all suspicious cases. General tonic and hygienic treatment is indicated.

PARALYSIS, CEREBRAL.—See Brain (Hemorrhage, Tumors, etc.).

PARALYSIS, DUCHENNE'S.—A chronic disease characterized by progressive muscular weakness, associated with an apparent hypertrophy of the affected muscles. There is an interstitial fibrous overgrowth of the muscles, frequently accompanied by an accumulation of fat and atrophy of the true muscle-fibers. The disease usually begins in the muscles of the calf, and spreads over the body, the muscles of the hand almost always escaping. There are marked lordosis and a characteristic gait, with wide separation of the legs and swaying of the body from side to side. The characteristic symptom is the manner in which the patient rises from the floor—he "climbs" up on his legs, on account of the weakened state of the extensor muscles of the back. The disease is essentially a chronic one, but the patient becomes absolutely helpless long before death. It is most common in young male children, usually under 10 years of age. The disease is entirely myopathic, no adequate nerve-lesion having as yet been discovered.

PARALYSIS, GENERAL, OF INSANE (Paretic Dementia).—An organic disease of the brain, characterized by progressive loss of power and by a deterioration of the mental faculties, ending eventually in dementia and death. The duration varies from a few weeks or months to three or more years, being, on the average, longer in females than in males, and in the well-to-do than in the poor.

Etiology.—The affection is most common in males between the ages of 30 and 60. It is induced by overwork and mental and physical strains, intemperance, syphilis, and lead-poisoning.

The lesion is essentially a meningoencephalitis, with thickening of the cerebral meninges and wasting of the cortical substance.

Symptoms.—In most cases mental symptoms precede distinct motor ones. General paralysis does not supervene in ordinary insanity. The mental symptoms occur in the most varied possible time and mode of sequence. The moral feeling, perturbed at first, rapidly undergoes disintegration and decay. After a preliminary despondency, the emotional state tends to be gay; later, to be depressed, morose, or peevish, and finally to die out. More or less dementia is present in all cases from the early stages, is irregularly progressive, and often very extreme toward the close.

Three stages are marked: (1) A period of mental alienation, associated with fibrillar tremblings, noticeable in the tongue and facial muscles; (2) a period of chronic mental failure and bodily decay; (3) a stage of complete mental ruin, in which there is failure of motor, sensory, and nutritive functions.

In the first stage there is much difficulty in deciding as to the nature of the disease, there being some alteration in the moral nature before friends notice any bodily defect, so that a gradual alteration in character may take place. The principal mental symptoms are alterations in demeanor, conduct, temper, and disposition, enfeeblement of memory and loss of power in the highest acquirements, especially if the latter demand much skill and originality.

The principal body signs and symptoms in the early period are some defect of sight, hearing, or smell. The onset may take any clinical form, as maniacal, melancholic, stuporous, or of the nature of dementia. Delirium of exaltation is a very frequent symptom. Whatever the form of onset, dementia is the natural tendency of the disease, and, therefore, loss of memory and filthy habits are likely to occur with much greater frequency than in ordinary melancholia.

The characteristic motor signs may be masked, and usually consist of increased difficulty of speech, stoppage or stuttering, or great effort to enunciate, associated with marked twitching of the lips or face. Great loquacity exists in the expansive forms, but amnesia is most often seen. A loss of expression in the lower part of the face, the lines being smoothed out, is found; the tongue is protruded with difficulty, or is jerked out and sucking; swallowing or masticatory movements are common.

In the second stage physical signs become more marked and speech more incomprehensible, the appetite is voracious, face expressionless, gait feebler, and the general condition worse.

In the third stage the extreme of mental and physical deterioration is reached, and the patient is bedridden.

Severe cases may end in death in a week, but the average duration is over 2 or 3 years, some cases lasting 10 to 15 years; is longer in females than in males, and in quite demented cases and in those of hereditary tendency.

Diagnosis.—General paralysis is frequently overlooked. Moral perversions are common, but distinct change in character in a man in middle life, especially if he has been active in business, should excite suspicion. From ordinary acute mania or other forms of insanity the diagnosis is difficult in the early stages, but made certain by the occurrence of motor symptoms. Acute mania from alcoholic excess may resemble general paralysis at the onset, especially if associated with exaltation and tremors. Syphilitic disease of the brain or meninges may simulate the demented forms of general paralysis. From the monomania of grandeur, the speech, and other motor symptoms, the more changeable nature of the exaltation and the course of the disease, differential diagnosis is made. Intracranial tumors sometimes cause simulation of the demented form of this disease. Disseminated sclerosis, dementia associated with hemiplegia or other paralyses, and paralysis agitans may possibly be confused with general paralysis. Epileptiform seizure frequently marks the onset of general paralysis, but true epilepsy is said never to be followed by the latter. Plumbism and excessive use of bromids may give rise to conditions simulating general paralysis.

Prognosis.—The disease is practically incurable when the characteristic symptoms have developed.

Treatment.—In the earliest stage complete cessation of all causes of emotional or mental strain may act beneficially, but instead of rest, attempts to stimulate to cheerfulness are usually made. No drugs appear to have any effect in cutting short the disease. Antisyphilitic remedies may be tried in appropriate cases. General paralytics are very susceptible to powerful drugs, and such should be used with caution. A return to home-life accelerates the final break-down, especially if followed by attemps at sexual intercourse or indulgence in any form of excess.

PARALYSIS, INFANTILE CEREBRAL. Synonyms.—Spastic hemiplegia, diplegia, or paraplegia.

Infantile Spastic Hemiplegia.—In most instances this paralysis is of the acute, acquired type, developing at any time after birth but usually before the fifth year.

Etiology.—It may be due to abnormal conditions or accidents or disease (especially syphilis) of the mother during pregnancy; it may be the result of lesions during delivery. After birth it may be caused by traumatism, embolism, scarlet-fever, pneumonia, measles, diphtheria, variola, mumps, typhoid fever, meningitis. It is very often brought on by pertussis. Convulsions may be the cause or the result of the lesion.

Pathology.—There may be hemorrhage, embolism or thrombosis. The main lesions found at autopsy are sclerosis and atrophy.

Symptoms.—The onset is sudden with convulsions, which are usually repeated, and coma. In exceptional cases the hemiplegia may come on suddenly in apparently well children. Fever is usually present, with delirium and vomiting. As the child recovers consciousness the paralysis is discovered usually complete though sometimes it is at first only paresis. If the face is involved, it soon recovers. Power is gradually restored in several weeks to the leg though in most cases a persistent halt remains, but the arm recovers so slowly that contractures are apt to develop in several years and moderate atrophy ensues. There is more or less rigidity as a rule, lessened during sleep and increased by excitement and attempts to overcome the spasm. Aphasia is common in right hemiplegias and is found too in left. Electrical reactions are usually normal. Disturbances in sensation are slight and transient. Posthemiplegic chorea or athetosis is often found. The mental condition is often defective though it may be normal. Epilepsy is a frequent sequel.

Infantile Spastic Diplegia. Synonyms.—Bilateral infantile spastic hemiplegia; Little's disease; spastic rigidity of the new-born; birth palsies.

Etiology.—The causes are the same as of infantile hemiplegia. Most cases date from birth and are due to lesions during delivery. The lesions are bilateral and involve practically only the motor areas of the cortex. Usually the primary cause of cerebral birth paralysis is meningeal hemorrhage. From the resulting blood-clot or from meningo-encephalitis, sclerosis or porencephalous defect follows.

There may be convulsions, often a series, after birth. In mild cases, however, the first symptom, limpness of the muscles, may be noticed only after 6 or 8 months. This flaccidity is often mistaken for rickets. Some rigidity of the legs and exaggerated knee jerks will be found later. Athetoid or choreic movements are seen frequently. Mental defect is usually present.

Infantile Spastic Paraplegia.—Etiology is the same as in the preceding types, with the additional factor premature birth.

Symptoms.—The spastic paralysis of the lower extremities dates from birth or the first years of life. There is talipes equinus or equinovarus, adductor spasm, rigid gait and no muscular atrophy. There may be slight or no mental defect.

Diagnosis.—Infantile cerebral paralysis must be differentiated from infantile spinal paralysis (see below). Spastic diplegia and paraplegia are distinguished from pseudoparalytic rigidity and tetany by the history—existing from birth; the parts involved: the legs almost to exclusion of arms; by the painless character of the spasm; and by the continuous duration.

Prognosis.—This is grave in diplegia and paraplegia. The majority of these due to intrauterine or birth lesions die in infancy, the rest usually are feeble-minded and helpless. The outlook is brighter in hemiplegia; the onset being later the brain is less apt to be injured seriously. The residual paralysis may be so slight that there may be no suspicion of a previous paralysis until the occurrence of epilepsy.

Treatment.—The stage of convulsion should be treated by chloral, absolute rest, ice to the head. The established paralysis is for the most part intractable, but baths, hygiene, gymnastics, good food, manipulations, surgical appliances, electricity, may be used. If mentally deficient, the child should be placed in an institution for the feeble-minded.

PARALYSIS, INFANTILE SPINAL. Acute Anterior Poliomyelitis; Acute Atrophic Paralysis.—A disease peculiar to childhood, and characterized by sudden paralysis of one or more limbs or of individual muscle-groups, and followed by rapid wasting of the affected parts, with reaction of degeneration and deformity. Acute poliomyelitis is the most frequent cause of paralysis in early life.

The disease may occur in adults, under thirty, though rarely. When it does, the symptoms are the same as in children; care, however, should be taken not to confound it with multiple neuritis.

Etiology.—This form of paralysis occurs most frequently during the first three years of life, very rarely after the fifth year. In a large proportion of cases the disease appears during the hot summer months, although it may occur at any time. It is believed to be due to an acute infection, and the fact that it sometimes prevails in epidemics would strengthen this theory. If, however, due to a microorganism, the specific one has not yet been demonstrated.

Pathology.—Infantile spinal paralysis is due to an inflammation of the gray matter of the anterior portion of the spinal cord. The region of the cord most commonly involved is the lumbar enlargement, and usually only one lateral half of the cord is affected. It is thought that the first changes are in the blood-vessels, from which the process spreads to the neuroglia, and produces proliferation of cells early, but later atrophy of the ganglion cells. In cases of long standing the part of the cord affected is distinctly smaller than normal.

The affected muscles degenerate, the fibers becoming small or disappearing entirely, their place being taken by adipose and fibrous tissue. The affected limb is shorter and the bones smaller than upon the sound side.

Symptoms.—The onset is sudden, and marked by fever, vomiting, convulsions, or even coma. The fever usually varies from 102° to 104° F., but some cases occur without any rise of temperature. In the great majority of cases it is, however, one of the first, and often the only, symptom which will be noticed. It generally lasts for 24 or 48 hours, though in some cases in which all the symptoms show marked severity it may continue for a week.

In most cases there are pains in the back and in the muscles of the extremities and a general hyperesthesia. There may be other disturbances of sensation, such as numbness and tingling.

As the symptoms of invasion gradually subside, the paralysis comes on. The development of the paralysis is quite rapid, often attaining its maximum in 24 hours, although sometimes it will be 2 or 3 days, or even a week, before its full extent is seen. At the start it is usually widely distributed, often involving all four extremities, but most frequently but one or two. The muscles of the trunk may be affected also, but the respiratory muscles usually escape.

Within a period of 1 or 2 weeks the initial widespread paralysis diminishes for several weeks, after which time little improvement takes place and the muscles then affected remain so permanently. Marked atrophy will soon be noticed in the paralyzed muscles, and the affected limb becomes distinctly smaller and shorter than its fellow. The electric reaction is important; with rare exceptions the affected muscles and the nerves supplying them exhibit a complete reaction of degeneration. The permanent paralysis may involve one or more parts of the body, but the lower extremities are much more frequently affected than the upper.

The most frequent deformities resulting from the paralysis are talipes valgus and varus, but most of the patients are able to walk with the assistance of braces.

Diagnosis.—The general symptoms at the onset have nothing characteristic about them, and no diagnosis can be made until the paralysis occurs. The acute onset, the spontaneous improvement in certain groups of muscles, the rapid wasting of those which are permanently affected, the absence of sensory symptoms, and the reaction of degeneration, all constitute a type which should not be mistaken.

In that epidemic form of poliomyelitis which so closely resembles epidemic meningitis, lumbar puncture should be performed in order to obtain a correct diagnosis.

The following table gives the principal points of difference between this disease and acute cerebral palsy:

ACUTE SPINAL PARALYSIS.	ACUTE CEREBRAL PARALYSIS.
Onset sudden, with fever, coma and convulsion.	The same.
Convulsions rarely repeated after first few days.	Convulsions likely to be repeated.
Paralysis flacid, associated with rapid atrophy.	Paralysis spastic. No rapid atrophy associated with rigidity and contractures.
Paralysis usually widely distributed.	Paralysis generally hemiplegic.
Electric reaction altered.	Normal.
Deep reflexes diminished or lost.	Exaggerated.
Intellect never permanently involved; no epilepsy.	Often involved; epilepsy frequent.

Prognosis.—The prognosis as regards life is favorable, but more or less paralysis will remain. In many cases in which the initial paralysis is quite general the retrogression may be so extensive as to leave but few of the muscles permanently affected; this result, however, is to be expected more generally when the primary paralysis is not widely distributed. Muscles which become atrophied, and which do not respond to the faradic current by the end of 6 months, or at longest one year, will remain useless.

Treatment.—During the initial stage the treatment is that of all febrile affections. Rest in bed, restricted diet, a laxative dose of calomel, small doses of phenacetin or acetanilid, if the nervous symptoms are marked, and sponge bathing for the nervous symptoms and the fever. When the nature of the disease is positively shown by the onset of paralysis, absolute quiet is essential. An ice-bag should be placed along the spine, or mild counterirritation to the spine by mustard plasters may be practised. No medicines are curative, and the remedies used should be directed to keeping up the general nutrition of the child. After all acute symptoms have subsided, electricity should be used. The faradic current should be applied to the affected muscles from 8 to 10 minutes every other day, or daily for months. Massage, probably, is more beneficial than electricity in aiding the nutrition of the muscles. The patient should be encouraged to use the weakened limb, which must be warmly clad and carefully protected from cold. Much may be done in the chronic stage by mechanic appliances to correct the deformities and support the limb. In others, surgical measures, as myotomy, tenotomy, etc., must be resorted to.

PARALYSIS, PSEUDOHYPERTROPHIC MUSCULAR.—See MUSCLES (Progressive Dystrophies).

PARALYSIS, SPASTIC SPINAL.—See LATERAL SCLEROSIS.

PARAMYOCLONUS.—The convulsive tremor of Friedreich, a functional neurosis marked by the sudden shock-like character of the muscular contractions, their bilateral symmetry, and the freedom of the extremities. There is no ataxia, paralysis, or anesthesia; electric irritability is normal; consciousness is unimpaired; the convulsive movements are usually in abeyance during sleep. The disease generally occurs in males, and manifests itself both in children and in adults. It is supposed to be caused by fright or physical overstrain.

Paramyoclonus multiplex is an affection characterized by clonic contractions, chiefly of the muscles of the extremities, occurring either constantly or in paroxysms. It occurs usually in males, and follows emotional disturbance, fright, or straining. The contractions are usually bilateral, and may vary from 50 to 150 a minute.

PARANOIA (Monomania).—A chronic mental disease, characterized by fixed logical or systematized delusions of persecution, unseen or impossible agencies, or of self-exaltation, the emotions and memory being only paroxysmally defective, while, however, the life of the individual is dominated by the delusions. The term paranoia, as it is now commonly used—to cover a group of insanities which are degenerative in origin, chronic in course, and characterized by systematized delusions, with little impairment of the emotional faculties—is not generally accepted as a synonym for monomania. There is generally a hereditary predisposition to insanity in monomania or paranoia. The exciting cause may be the result of an acute mania or melancholia, or the result of alcoholism or of malnutrition in those who have had a struggle to keep their position in the world; extreme worry in individuals with mental instability; following primary or acute delusional insanity.

Symptoms.—The course of monomania is essentially chronic, the delusions becoming perfectly fixed and unchanging upon one particular subject or set of subjects, which in turn dominate the life of the individual. Most commonly these systematized delusions are delusions of persecution or suspicion, delusions of exaltation or of pride, and delusions of unseen agencies.

Diagnosis.—In the diagnosis of monomania there are three points to keep in mind: (1) The duration: the fixed, systematized delusions must have existed over one year. (2) The absence of symptoms of mania or melancholia. (3) The presence of systematized delusions affecting the personnel of the individual.

Monomania is an incurable disease. Unless tuberculosis develops within a few years, dementia results.

Treatment is symptomatic. The best hygienic conditions are demanded. See MANIA.

RARAPHIMOSIS.—Retraction and constriction of the prepuce behind the glans penis. See PENIS.

PARAPLEGIA, ATAXIC (Posterolateral Sclerosis, Gowers' Disease).—Degeneration of the posterior and lateral columns of the cord. The etiology is unknown. Syphilis, heredity, neurotic tendency seem to be factors. It is always associated with general paralysis of the insane. The symptoms resemble spastic paraplegia in the loss of power and muscular rigidity and tabes dorsalis in the marked incoordination. The reflexes, however, are exaggerated, including ankle clonus and knee-jerk. The sphincters are sometimes involved. Treatment is chiefly symptomatic. See PARALYSIS.

PARASITES.—Parasitism is essentially a condition of infestment of some form of life by another living organism, usually of lower type. The parasite is the invading form, whether animal or vegetable, and is spoken of as either an *ectoparasite,* if living upon the surface, or as an *endoparasite,* if inhabiting some part of the internal structures of the invaded organism. The latter is spoken of as the *autosite,* or *host;* and when in the life of the parasite there are special stages in its cycle, the host of the fully developed organism is spoken of as the *primary* or *definitive host,* the one or more hosts accommodating the intermediate stages of the parasite being denominated the *secondary* or *intermediate hosts.* Parasites of man are *animal* and *vegetable.*

There are three kinds of parasitism: (1) *True Parasitism.* In this condition the parasite does harm to the host, and derives all the benefit of the association; example, the hook-worm infecting man or animals. (2) *Mutualism.* In this there is mutual benefit to each party of the association; example, the presence of colon bacilli in the intestines, where the bacillus is furnished a suitable habitat and in return protects its host against strictly pathogenic bacteria. (3) *Commensalism.* Here there is benefit to the parasite, but no injury to the host; example, the trichomonas vaginalis which lives in the vaginal mucus, but, so far as is known, does no injury to the host.

Animal Parasites.

The *effects of animal parasitism* may be practically *nil* according as the numbers of parasites present are small or the influences of the parasites are slight, or according to the part of the host affording accommodation to the parasites in question. On the other hand, pathogenic influences are exerted and anatomical changes and symptoms of variable intensity are produced by animal parasites just as in case of infection by pathogenic bacteria. The irritation caused by the presence and by the movements of the parasites, with consequent inflammatory effects, as well as the possibility of tissued estruction, pressure atrophy, and secondary degenerations, must be taken into consideration. The possibility of obstruction of more or less important channels, as the occlusion of blood or lymph vessels by the ova of blood flukes or the embryo filarial worms, as well as a large number of similar possible disturbances in other parts of the body by one or other form of parasites, must from time to time be reckoned with. The abstraction of food-stuff from the economy of the host by the parasite cannot be looked upon as of serious import in itself, but the possibility of loss of valuable matter, as in blood destruction by the malarial hematozoon or the loss of blood by hemorrhage from the wounds in the intestinal mucosa through lesions caused by hook-worms and other sucking parasites, may constitute serious factors of disease for the host. Moreover, there unquestionably are toxic influences generated in one or other manner in animal parasitism which may exert marked and deleterious influences upon the infested organism, as doubtless in malaria, in uncinariasis, bothriocephalus disease and a number of other similar affections.—(*Tyson.*)

The important classes of animal parasites in man are the PROTOZOA (*q. v.*), the WORMS (*q. v.*), and the arthropods. Of the arthropods the important ones are (1) the *acarina* (mites, ticks), to which species belong the acarus scabiei (the itch mite), the leptus autumnalis (the harvest bug), and the demodex folliculorum (the comedo mite); (2) the *pediculidæ* (lice); and (3) the *diptera*, to which belong the fleas and flies. *Myiasis* is a condition due to the deposition of the larvæ of flies in open sores, or in the nose, ears, eyes, pharynx, or vagina.

Insects and Communicable Disease.—Recent studies in communicable diseases have shown that certain insects are essential to the propagation of some maladies, and incidentally are of importance in others. In malaria the mosquito is certainly the most important if not the only means by which the disease is spread; in this affection the sexual cycle of the plasmodium is completed in infected mosquitos. It is generally conceded that the mosquito is necessary to the propagation of yellow fever, the immediate cause of which is not known. In malaria and filariasis the animal parasites undergo definite cycles of evolution in the interior of the insect. In trypanosomiasis the tsetse-fly inoculates the disease from animal to animal, but, so far as at present known, the flagellate parasite has no definite cycle within the insect. There are reasons for believing that relapsing fevers can be transmitted by bedbugs, and that the bites of fleas coming from plague-stricken man or animals may induce the disease. In another group of diseases, including cholera, typhoid, tuberculosis, plague, and infections of the types indicated, the germ causing the disease may be deposited upon the food, and in that and similar ways be conveyed from sources of infection to the healthy.—(*Coplin.*)

Vegetable Parasites.

The chief forms are the schizomycetes (fission fungi) or BACTERIA (*q. v.*); the blastomycetes or YEASTS (*q. v.*); and the hyphomycetes or *molds*. The mold fungi are made of filaments, hyphæ, so interlaced that they form a network, the mycelium. They reproduce by sporulation. Pathogenic molds are the direct agents in the production of the following diseases: favus (achorion Schönleinii); thrush (oïdium albicans); actinomycosis (actinomyces, ray fungus); mycetoma (streptothrix madura, one of the actinomyces group). The large-spore fungus or smallspore fungus to which ringworm is due has been shown to be not a common mold, but a specific fungus. Tinea versicolor is due to the microsporon furfur; erythrasma is caused by the microsporon minutissimum; pinta is due to several fungi of the class arpergillus; to this class *otomycosis* and *myringomycosis* are believed to be due. Sticker has found 16 cases of pulmonary disease to be caused by the aspergillus fumigatus—*aspergillomycosis*. The leptothrix—a long segmented fungus—is abundant in the lungs in pulmonary gangrene and may cause the formation of patches on the tonsil simulating diphtheritic membrane—*pharyngomycosis leptothrica*. The *leptothrix buccalis* is thought to play a significant rôle in the production of caries.

PARASPECIFIC SEROTHERAPY.—See SERUM THERAPY, (Paraspecific).

PARATYPHOID FEVER.—An infectious fever exactly simulating typhoid clinically, but due to a bacillus intermediate between the bacillus typhosus and the bacillus coli, called the paratyphoid or paracolon bacillus. The Widal reaction is negative, but the serum reacts upon fresh cultures of the paratyphoid bacillus.

Diagnosis is based solely on the paratyphoid agglutination test.

Treatment is the same as that of enteric fever except that obviously the paratyphoid bacillus or its product is used in specific treatment.

PAREGORIC.—The camphorated tincture of opium. It is of especial service in the treatment of diarrhea, because it contains a volatile oil and camphor, and it is a most common ingredient of cough mixtures.

In bronchitis:

℞.	Paregoric,	℥ ss
	Tartar emetic,	gr. j
	Potassium nitrate,	ʒ ij
	Bitter-orange water,	℥ xij.

Give 1 teaspoonful every hour when needed for the cough.

In diarrhea:

℞.	Paregoric,	ʒ iij to iv
	Dermatol (bismuth subgallate),	ʒ ij
	Chalk-mixture, add enough to make	℥ iij.

Give 1 teaspoonful every hour until relief is obtained.

PAREIRA (Pareira brava).—The dried root of *Chondrodendron tomentosum*, a plant of South America. It is diuretic and laxative, and tonic to the mucous membrane of the genitourinary organs. It is valuable in cystitis, gonorrhea, and leukorrhea, and is used internally and locally for the bites of poisonous serpents, etc. **P., Flext.** Dose, 10 to 45 minims. **P., Infus.**, unof. Dose, 1 to 2 ounces.

PARESIS.—See PARALYSIS (General).

PARIS GREEN.—A preparation of copper, chemically known as cupric acetoarsenite, and used as a pigment for wall-paper coloring and as an insecticide. It is highly poisonous; and for treatment of the poisoning by Paris green see ARSENIC.

PARONYCHIA (Whitlow).—An abscess of the thumb or fingers.

The superficial whitlow consists of inflammation of the surface of the skin of the last phalanx, with burning pain or effusion of a serous or bloody fluid; it is generally seated immediately around and beneath the nail; it is attended by great pain and throbbing, and suppuration at the root of the nail, which may come off. The deep-seated variety, or *tendinous whitlow*, as it is called, is attended by severe, throbbing pain, exquisite tenderness, light but tense and resisting swelling, and very great constitutional disturbance. It may lead to suppuration, the pus extending along muscles and tendons from the fingers to the palm, and even to the forearm, causing sloughing of the tendons, with severe irritative fever, sometimes placing life in danger, and frequently leaving the limb stiff and useless.

If purgatives and fomentations do not speedily bring relief, the finger must be freely laid open. The knife, used early, should be carried deep enough to feel the resistance of the bone or tendon; the sheath of the latter should be thoroughly laid bare. If the matter has extended to the hand, an opening should be made until complete drainage is established. See NAILS (Diseases).

PAROÖPHORITIC CYSTS.—See OVARY (Diseases.)

PAROTID DUCT, DIVISION.—See FACE (Injuries).

PAROTITIS.—Inflammation of the parotid gland, commonly called MUMPS (*q. v.*).

PAROVARIAN CYSTS. See OVARY (Diseases).

PARSLEY.—A biennial plant, from the fruit of which is extracted apiol a nonvolatile, oily liquid, of green color, acid reaction, and pungent taste; it is often found in commerce as an impure oleoresin. See APIOL.

PARTURITION.—See LABOR.

PARULIS.—See ALVEOLAR ABSCESS.

PASTEURIZATION.—See MILK (Pasteurized).

PASTILLES.—See TROCHES.

PATELLA.—See KNEE-JOINT (Injuries).

PATHOLOGIC TECHNIC.—In this epitome, much of which is founded on the admirable work of Mallory and Wright on "Pathologic Technic," there are given very briefly the fundamental practical points. The subject is elaborated more fully under such special headings as BACTERIOLOGY, BLOOD (Examination), FECES (Examination), MICROSCOPE, POSTMORTEM EXAMINATION, SPUTUM, URINE (Examination), etc. In addition special pathologic technic is discussed under the headings of certain diseases, as GONORRHEA, TUBERCULOSIS, TYPHOID FEVER, etc.

Examination of Fresh Material.

This may be examined after being teased apart or in sections.

Teased Preparations.—Place a small section on a glass slide, and cover with a normal salt solution, and tease apart by means of two sharp needles.

Sections of Fresh Specimens.—Freeze the specimen by the evaporation of ether, and shave off a small section by means of the blade of a carpenter's plane, allowing the specimen to fall into a normal saline solution. It should be spread out on a slide while remaining in the solution, then dried by blotting paper, and immediately examined. If it is desired to stain the specimen, add a few drops of Loeffler's alkaline methylene-blue solution, wash in water, and examine. Oil or fat in the fresh specimen may be demonstrated by means of a 1 percent solution of osmic acid.

Cover-glass Preparations.—Such preparations are usually made in examining blood, sputum, or other fluid or semifluid substance. In the case of sputum a tiny mass is placed on a cover-glass, another is pressed gently down upon this, and the two glasses are separated by sliding one over the other, the object being to secure a thin, even film on each glass. The film may also be spread with the edge of a cover-glass or with a platinum spatula. The preparations are then left to dry in air, or they may be dried by exposing them to a temperature of 120° F. for 20 minutes, or by passing them quickly 3 times through the flame of a spirit-lamp or Bunsen burner. When dry, they are ready to stain. To obtain a cover-glass preparation of blood, cleanse the finger, prick the tip, wipe off the first drop of blood that exudes, touch the apex of the second drop with a cover-glass, spread in the manner described, and dry in air.

Injection Masses.—On account of improvements which have been made in general pathologic technic within recent years, injections are not so essential as they were formerly, and are not generally used. If the specimen is well stained, the vessel and vessel walls are sufficiently prominent to be studied without being injected.

There are two kinds of injection masses—(1) cold and (2) hot. If the hot method is used, the fluid is injected into the tissue heated to the same temperature as the injection mass. The instruments are a syringe with various sized cannulas. Blood-vessels should first be washed out with normal salt solution.

Cold Injection Mass:

Soluble Berlin blue,	1
Water,	20.

Warm Injection Mass (Carmin Gelatin).—The warm injection mass is better to use. Place 2 to 2.5 grams of best carmin in about 15 c.c. of water containing enough ammonium hydroxid to dissolve it. Filter and place over a water-bath, and add a concentrated solution of gelatin, stirring constantly. Gradually add acetic acid until a bright red shade is produced. Care must be exercised in order to prevent too much acid from being used, otherwise the mass will become worthless, owing to the precipitation of carmin.

Fixing Reagents.—These reagents are used for the purpose of preserving intact the tissues, cells, and especially the nuclei. When the **fresh specimen** is obtained, it is immediately placed in the fixing reagent and afterward embedded and stained. A good fixative penetrates and kills tissues quickly, preserving the tissue elements. The choice of a proper fixing reagent for a given tissue depends largely on the nature of the pathologic lesions present or suspected, and upon the object for which the tissue is preserved. For bacteriologic study of tissues, and for many valuable and chemic reactions, alcohol is best as a fixative reagent. For finer histologic work Zenker's or Orth's fluid is to be preferred. Flemming's solution is recommended for renal tissue when there is fatty degeneration. Tissues fixed in alcohol or in a solution of formaldehyd may remain as long as desired. Tissues hardened in most of the other fixatives must be transferred, after thorough washing in water, to alcohol for preservation. It is best to pass the specimen successively through alcohol of different strengths, as 30, 60, 90, and 96 percent, allowing it to remain from a few hours to a day in each strength. For general purposes the specimen may be transferred from water to alcohol of 70 to 80 percent, in which it may remain until it is desired to embed it.

Alcohol is used in the laboratory in 95 to 96 percent strength. The exposed surface of the tissues become shrunken and extremely hard when placed in alcohol. Tissue to be placed in either absolute or 95 percent alcohol should be cut into thin sections, 1/2 cm. thick. The volume of alcohol to be used should be 15 to 20 times as great as the specimen, and it should be changed after 3 or 4 hours. The tissue should be kept in the upper part of the alcohol by means of absorbent cotton, or the jar may frequently be inverted and the alcohol thus kept of even strength.

For general purposes it is best to place tissues at first into 80 percent alcohol, which should be replaced in 2 to 4 hours by 95 percent alcohol. In this way less shrinkage is caused and the surface of the tissues is not made so hard.

Zenker's Fluid:

℞.	Potassium bichromate,	2.5	gm.
	Sodium sulphate,	1	gm.
	Mercuric chlorid,	5	gm.
	Glacial acetic acid,	5	c.c.
	Water, enough to make	100	c.c.

This solution is practically Müller's fluid, saturated with mercuric chlorid and 5 percent of glacial acetic acid.

On account of the evaporation of the acid, it is probably best not to add all the acetic acid to the stock solution, but only in the proper proportion to the part selected for hardening.

Directions for Use.—(1) Fix the tissues in the solution for from 1 to 24 or 48 hours, according to thickness; (2) wash in running water 12 to 24 hours; (3) preserve in 80 percent alcohol until used.

Zenker's fluid penetrates quickly so that tissues do not require to be so thin as in the case of other fixatives. They should not, however, exceed 1/2 cm. in thickness. Occasionally there is a precipitation of mercury, which may be removed by adding a small quantity of tincture of iodin (up to 1/2 of 1 percent) to the alcohol in which the specimens are preserved. As soon as the color of the iodin disappears on account of its forming a colorless soluble compound with mercury, more iodin must be added, until the alcohol remains stained faintly yellow. Tissues hardened in Zenker's fluid stain best with alum hematoxylin. Good results are also obtained with eosin, followed by Unna's alkaline methylene-blue solution. Fuchsin and safranin stains are also useful. Nuclear figures, red blood-corpuscles, and protoplasm are all preserved by this fixative method.

Orth's Fluid:

℞.	Potassium bichromate,	2 to 2.5	gm.
	Sodium sulphate,	1	gm.
	Water,	100	c.c.
	Formaldehyd (40 percent solution),	10	c.c.

The formaldehyd should be added only at the time of using, otherwise the solution will become darker in 2 days, and a crystalline deposit will occur. The tissue should not be over 1 cm. in thickness. The specimens should be washed thoroughly in running water for from 6 to 24 hours, and then placed in 80 percent alcohol.

Mercuric Chlorid.—Use a saturated solution (made by heat) in normal salt solution. The addition of 5 percent of glacial acetic acid is sometimes advisable. (1) Harden thin pieces of tissue (2 to 5 mm. in size) for 1 to 6 hours; (2) wash in running water for 24 hours; (3) preserve in 80 percent alcohol. Tissues fixed by this method may be stained by nearly all solutions. With the Heidenhain-Biondi triple stain it yields good results.

Müller's Fluid:

℞.	Potassium bichromate,	2 to 2.5	gm.
	Sodium sulphate,	1	gm.
	Water,	100	c.c.

Harden the tissues for from 6 to 8 weeks. Change the fluid daily during the first week; once a week thereafter. Ordinary tissues are then washed in running water overnight before being placed in alcohol. Nervous tissue is transferred directly from the fluid to the alcohol. This fluid hardens tissues slowly without shrinkage, but is a poor nuclear fixative and is gradually being displaced by more rapid methods.

Formalin.—The gas, formaldehyd (H.COH), is soluble in water to the extent of 40 percent formalin). The best strength of formaldehyd to use for fixing tissues is a 4 percent solution—that is, 10 parts of the aqueous 40 percent solution (formalin) to 90 parts of water—or, better, normal salt solution.

Sections of ordinary tissues not over 1 cm. thick are hardened in 24 hours. They may then be transferred to alcohol or may remain indefinitely in the formalin solution. Thin pieces are sufficiently hardened in 3 hours, when they may be frozen and cut, washed in water, then in alcohol, and stained.

Chromic Acid.—Used in aqueous or alcoholic solution in strengths varying from 0.1 to 2 percent. Weaker solutions are used for nerve tissue. Wash out several hours in running water. If the object is preserved in alcohol, it must be protected from the light, or a precipitate will be thrown down on its surface. The brownish-green color of objects fixed in chromic acid may be removed by treating them with hydrogen dioxid. A 0.02 percent solution is recommended for macerating nerve tissue and nonstriated muscle tissue, a cube of 5 mm. requiring about 24 hours' immersion in 10 c.c. of the medium.

Flemming's Fluid (first formula):

Chromic acid,	0.2 gm.
Glacial acetic acid,	0.1 c.c.
Water,	100 c.c.

This is especially recommended for fixing the achromatic spindle-fibers in nuclei.

Second formula:

One percent chromic acid,	45 c.c.
Two percent osmic acid,	12 c.c.
Glacial acetic acid,	3 c.c.

This fixes small pieces (2 to 3 mm. thick) in from a few to 24 hours, and is useful for fixing the figures in cell-division and for many other purposes.

A weaker solution is also used:

One percent osmic acid, Glacial acetic acid,	each, 10 c.c.
One percent chromic acid,	25 c.c.
Water,	100 c.c.

The second formula is the one generally known as Flemming's fluid.

Decalcification.

Tissues to be decalcified should be cut into thin slices of proper sizes (from 2 to 3 mm. thick), for embedding in celloidin. Softer tissues need not be thinner than 4 to 6 mm.

Steps in Decalcifying.—(1) The tissues must be thoroughly hardened, the three most useful reagents being alcohol and Zenker's and Orth's fluids. After using either of the two last reagents, the tissues must be washed thoroughly in water and placed in alcohol for at least 24 hours. They will then be ready for decalcification. (2) The decalcifying fluid should be used in large amounts, and, if necessary, be frequently changed. (3) After decalcification the tissues are to be thoroughly washed in running water for 24 hours, to eliminate every trace of the acid. (4) The tissues finally must be hardened again in alcohol.

The principal **decalcifying agents** are nitric acid, hydrochloric acid, chromic acid, and picric acid.

Directions for Using Nitric Acid.—(1) Decalcify in large quantities of a 5 percent aqueous solution of nitric acid, changing the solution every day for 1 to 4 days. (2) Wash for 24 hours in running water, to remove every trace of the acid. (3) Harden in 80 percent and then 95 percent alcohol. Embed in celloidin.

Phloroglucin and Nitric Acid.—Phloroglucin is not a decalcifying agent, but is added to nitric acid to protect the tissues, while allowing a stronger solution of the acid to be used than would otherwise be possible. The solution is prepared by dissolving 1 gram of phloroglucin in 10 c.c. of nitric acid. Solution takes place quickly, with the generation of considerable heat. The fluid is reddish-brown at first, but becomes yellow in the course of 24 hours. Dilute with 100 c.c. of a 10 percent solution of nitric acid. This gives nearly a 20 percent solution of nitric acid. The process of decalcification in this fluid is extremely rapid—a few hours only, as a rule, are required.

Picric Acid.—A saturated aqueous solution containing an excess of crystals is sometimes used for decalcifying. It has no injurious action on tissues, but is extremely slow, frequently requiring months. Fresh tissues may be placed directly in the solution, which hardens and decalcifies at the same time. Instead of being washed out in water, in which they would macerate, the pieces of tissue are placed directly in 70 percent alcohol to remove the acid.

Embedding Processes.

Sections may be cut by means of the razor or Microtome (*q. v.*). Two substances are now principally used for embedding: they are celloidin and paraffin. Celloidin methods are preferred for general pathologic work and for histologic work, while paraffin sections should be reserved for the finest details or for the study of special tissues.

If large sections are desired, celloidin is preferable; if small sections are desired, paraffin is used.

Embedding in Celloidin.—Allow the section to macerate from 24 hours to several days in 2 different solutions of celloidin. The two solutions are spoken of as thin and thick solutions. To make a *thick* celloidin, 30 grams of the dry celloidin are dissolved in 500 c.c. of a mixture of equal parts of ether and absolute or 95 percent alcohol. This gives a 6 percent solution.

Diluted with an equal amount of ether and alcohol solution, it forms *thin* celloidin.

The steps of the embedding process are as follows (Mallory and Wright): Pieces of tissue which have been properly fixed and finally preserved in 80 percent alcohol are first to be cut with great care. They should rarely be over 4 to 8 mm. thick; for most purposes 2 mm. will be sufficient. Pieces of this thickness will furnish several hundred sections, will embed more quickly than larger masses, and will be more rigid when mounted on a block. They should never be broader or longer than is necessary to show the whole of the process under study. Very thin celloidin sections cannot usually be obtained with tissues over 1 1/2 or 2 cm. square, and smaller dimensions are preferable. Beginners usually embed larger pieces than are necessary.

The trimmed pieces of tissue are first hardened and dehydrated for 24 hours in 95 percent alcohol; then macerated in equal parts of alcohol and ether for the same length of time, to prepare them for the thin celloidin. In the latter they remain at least 24 hours, preferably for a number of days if at all thick, for in this solution occurs most of the infiltration with celloidin. Finally, the pieces are macerated 24 hours or more in thick celloidin. They are then mounted on blocks of vulcanized fiber, exposed to the air for 2 or 3 minutes until the surface hardens a little, and placed in 80 percent alcohol for 6 to 24 hours to allow the celloidin to harden.

Summary of the Different Steps in Celloidin Method.—(1) Place in 95 percent or absolute alcohol for 24 hours; (2) then in ether and 95 percent or absolute alcohol (equal parts) for 24 hours; (3) in thin celloidin for from 24 hours to 1 or more weeks; (4) in thick celloidin for from 24 hours to 1 or more weeks; (5) mount on blocks of vulcanized fiber; dry for 1 or 2 minutes in the air; (6) harden the celloidin in 80 percent alcohol for from 6 to 24 hours.

In cutting, the microtome knife should be held very obliquely, and covered with 80 percent alcohol. Celloidin sections may be stained by nearly all methods without removing the celloidin. It can be removed, however, by placing the sections in absolute alcohol, in oil of cloves, or in equal parts of alcohol and ether for 5 to 10 minutes, then passing the sections back through absolute into ordinary alcohol.

To Transfer Sections to the Slide.—Transfer the section from water to a slide and dry with cloth and press down firmly with filter-paper or blotting paper before it becomes dry. It may also be transferred in the following manner: Place in 95 percent alcohol and transfer to the slide; at the same time allow the vapor of ether to soften the section, when it may be smoothly fixed to the slide; wash with 80 percent alcohol to harden the celloidin.

Embedding in Paraffin.—This method is very useful, especially when thin sections are desired. The pieces of tissue should be small, soft, and of uniform consistency. In pathologic work it is better to cut the sections and to stain them after they are fastened to the slide than to stain in the mass beforehand, because a variety of stains may be used, which is a distinct advantage. The first step in the preparation of hardened tissues for the paraffin bath is to cut them into small, thin, square or rectangular pieces not over 1 cm. square, preferably not over 2 to 3 mm. thick. The pieces of tissue are then thoroughly dehydrated by macerating first in 95 percent and then in absolute alcohol. From alcohol they are put in some substance, such as chloroform or oil of cedar, which has the property of mixing with alcohol and of dissolving paraffin. From chloroform they are transferred to a saturated solution of paraffin in chloroform, and then passed through 2 or 3 separate baths of the melted paraffin to get rid of every trace of chloroform. If oil of cedar is used, the specimens are transferred directly from it into the melted paraffin.

Summary of Different Steps in Paraffin Method.

METHOD NO. I.

1. Ninety-five percent alcohol,	6 to 24 hours.
2. Absolute alcohol,	6 to 24 hours.
3. Chloroform,	6 to 24 hours.
4. Chloroform saturated with paraffin,	6 to 24 hours.
5. Paraffin bath, 3 changes,	1 to 6 hours.
6. Embed and cool quickly in cold water.	

METHOD NO.2

1. Ninety-five percent alcohol,	6 to 24 hours.
2. Absolute alcohol,	6 to 24 hours.
3. Oil of cedar, 2 changes,	6 to 24 hours.
4. Paraffin, 3 changes, until no odor of oil of cedar,	2 to 8 hours.
5. Embed and cool quickly in cold water.	

In the second method instead of oil of cedar, xylol, equal parts of oil of cloves and turpentine, or oil of cloves and xylol may be used.

For embedding the specimens, metallic boxes, or paper boxes made of stiff writing-paper, may be used. Melted paraffin is poured into the paper box to the depth of about 1 cm. The pieces of tissue are placed in the box with that side down from which sections are preferred. Several pieces of tissue are thus placed in the melted paraffin when the box is placed upon cold water. After the paraffin has hardened, the paper is removed, and the paraffin is divided up according to the pieces in it.

One of the blocks is fastened to the object-holder by heating the latter in a flame until it will just melt the paraffin when the block is held in proper position against it. The holder is then quickly cooled in cold water. Trim off the overlying paraffin until the specimen is reached, and adjust in the paraffin microtome. To get the best specimens the temperature of the room must be so regulated that the sections are ribbon-shaped.

The sections are laid on the surface of a large dish of warm water, about 44° C., and, if necessary, gently stretched so as to remove wrinkles. Paint the surface of a slide with a thin layer of Mayer's glycerin albumin mixture (equal parts of white of egg and glycerin); wipe off excess with a towel so that a faint layer is left; dip the slide under the sections; arrange them in order; lift the slide, and drain off the water. The slide is then placed in a slanting position until dry, when it is put in the thermostat for from 2 to 12 hours at a temperature of 54° to 60° C. To get rid of the paraffin in the sections they are treated with 2 or 3 changes of xylol, and then with absolute alcohol, followed by 95 percent alcohol.

If the celloidin and oil of cloves mixture is used, the paraffin is removed by means of xylol, followed by oil of origanum or oil of bergamot, and finally by 95 percent alcohol, because absolute alcohol will dissolve the celloidin (Mallory and Wright).

Serial Sections by the Celloidin Method.—The specimen is embedded, mounted on vulcanized fiber, and hardened in 80 percent alcohol. Moisten the knife of the microtome with 95 percent alcohol. As the sections are cut they are drawn upon the surface of the knife and arranged in the proper order by means of a camel's-hair brush. Place the slide against the back of the knife and transfer the section by means of the camel's-hair brush. The section is then fastened to the slide by allowing a few drops of ether to be poured upon it, after which all the edges are smoothed down very carefully. The slides are then numbered, and may be kept in a jar of 80 percent alcohol.

Serial Sections by the Paraffin Method.—Cut ribbons a yard long, if necessary, and place them on sheets of paper in proper order. They may then be divided into short series with a needle, and fastened to the slide by means of Mayer's albumin mixture.

Staining Solutions.

Aqueous Alum-hematoxylin Solution:

Hematoxylin in crystals,	1
Saturated aqueous solution of ammonium-alum,	100
Water,	300
Thymol,	a crystal.

Dissolve the hematoxylin in a small quantity of hot water. The combined solution is then exposed to light in a bottle tightly stoppered with a plug of cotton. The solution will be ready for use in about 10 days, after which time it should be kept in a tightly stoppered bottle. It is very easily prepared and gives excellent results.

Delafield's Hematoxylin:

Hematoxylin in crystals,	4 gm.
Alcohol, 95 percent,	25 c.c.
Saturated aqueous solution of ammonium-alum,	400 c.c.

Add the hematoxylin dissolved in the alcohol to the alum solution, and expose the mixture in an unstoppered bottle to the light and air for 3 or 4 days. Filter, and add—

Glycerin,	100 c.c.
Alcohol, 95 percent,	100 c.c.

Allow the solution to stand in the light until the color is sufficiently dark, then filter and keep in a tightly stoppered bottle. The solution keeps well and is very powerful. So long as it is good, the solution has a purplish tinge.

Alum-carmin:

Carmin,	2 gm.
Alum,	5 gm.
Water,	100 c.c.

Boil 20 minutes, adding enough water to make up for that lost in evaporation. When cool, filter and add a crystal of thymol to prevent the growth of mold.

Methylene-blue.—A saturated solution in 95 percent alcohol or absolute alcohol should be kept in stock to be used in making other solutions. This can be used as a stain by adding 1 part to 9 parts of water.

Loeffler's Alkaline Methylene-blue Solution:

Saturated alcoholic solution of methylene-blue,	30 c.c.
Solution of caustic potash in water (1:10,000),	100 c.c.

This solution keeps well for long periods of time.

Gabbett's Methylene-blue Solution:

Methylene-blue,	2
Sulphuric acid,	25
Water,	75.

Used as a decolorizer and contrast stain for tubercle bacilli.

Fuchsin.—A saturated alcoholic solution to be kept in stock. See FUCHSIN.

Ziehl-Neelsen's Carbol-fuchsin:

Saturated alcoholic solution of fuchsin,	10 c.c.
Five percent carbolic acid water,	90 c.c.

This solution stains quickly and keeps well.

Gentian-violet.—A saturated alcoholic solution; should be kept in stock.

Ehrlich's Anilin Gentian-violet Solution:

Saturated alcoholic solution of gentian-violet,	16 c.c.
Anilin water,	84 c.c.

Mix and let stand for 24 hours. Does not keep longer than 1 week or 10 days.

Safranin.—Any of the three following solutions may be used:

1. A saturated aqueous solution of safranin O, soluble in water (to be made with aid of heat).

2. A mixture of equal parts of a saturated aqueous solution of safranin O, soluble in water, and a saturated alcoholic solution of safranin, soluble in alcohol.

3. Two percent anilin water, 100
   Safranin O, soluble in water, in excess.

Saturate the solution with heat (60° to 80° C.), and filter.

Methyl-violet.—Aqueous solutions of several strengths, as 0.5 to 2 percent. Stains nuclei of cells, bacteria, etc.

Eosin.—Stains rapidly and gives a beautiful, diffuse, rosy hue. It is one of the best contrast stains with hematoxylin. Make a 5 percent aqueous solution, and dilute as required. It is also a specific stain for red blood-corpuscles (to which it gives a copper color), for certain leukocytes, and for the giant-cells of leprosy and tubercle.

Eosin-hematoxylin stain and the "polychrome" *methylene-blue, eosin solution* (*Romanowsky stain*) are excellent for routine work. The former combined with Wright's stain is in conjunction especially valuable in the study of nuclear structures. The Romanowsky stain is particularly serviceable in examining the malarial organism and other parasites.

Ehrlich-Biondi-Heidenhain Triple Stain.—To 100 c.c. of a saturated aqueous solution of orange add, with continual agitation, 20 c.c. of a saturated aqueous solution of acid fuchsin and 50 c.c. of a like solution of methyl-green; dilute with from 60 to 100 volumes of water. A drop on blotting paper should form a spot bluish-green in the center, orange at the periphery; a red zone outside the orange indicates that the mixture contains too much fuchsin. From 6 to 24 hours are required to stain. Wash out in alcohol and clear in xylol. Chromatic elements are colored blue; cytoplasm, violet or orange-red; karyoplasm the same, but in lighter tones, and all the denser protoplasmic elements the same, but darker (Gilson). This is the best stain for photomicrography, except for connective tissue (Lindsay Johnson). A slightly acid reaction of the alcohol used for washing out will produce a relatively strong coloration by the methyl-green; while that by the fuchsin will be relatively pale; the opposite result will be obtained if the alcohol contains a trace of alkali. The addition of very dilute acetic acid, until the red tint is markedly intensified, will restore the energy of the fuchsin, which is likely to decline after a time (Heidenhain).

Wright's Stain.—A modification of Jenner's stain, an alkaline eosinate of methylene-blue. To a 1/2 percent aqueous solution of sodium bicarbonate in an Erlenmeyer flask is added 1 percent of Grübler's medicinal methylene-blue. The mixture is placed in steam sterilizer for an hour. When cooled to it is added with constant stirring a 1 to 1000 aqueous solution of Grübler's water-soluble yellow eosin till the original color changes from blue to purple and forms a yellowish scum on the surface. The resulting precipitate upon filtration is dried and added to methyl alcohol (3/10 gram will require 100 c.c. for solution). The solution is filtered and to the filtrate is added 25 percent of methyl alcohol.

Giemsa Stain.—The formula is as follows: Azure II, 3 grams; eosin B. A., 0.8 gram; glycerin (C. P.), 250 c.c.; methyl alcohol (C. P.), 250 c.c. The films are fixed in methyl alcohol and then stained 5 minutes in a mixture of 14 drops of the stain to 10 c.c. of distilled water. A trace of sodium carbonate added to the water accentuates the basic stains. Then wash, dry and mount.

Pianese Double Stain.—Prepare a saturated solution of nigrosin in a saturated alcoholic solution of picric acid; mix 2 volumes of this with 1 volume of anilin water, and evaporate in open air. The crystals deposited are dissolved in absolute alcohol, and from this solution green crystals are obtained, soluble in alcohol, ether, and water. For tissues, make a 2 percent solution in alcohol; for microorganisms, in water. Stain sections first in lithium carmin, treat with acid alcohol, wash, and immerse in an alcoholic solution of picronigrosin until they assume a brown hue. Decolorize in oxalic acid. Nuclei are stained red; plasma dark yellow; cartilage yellow; connective tissue pale green; elastic fibers violet.

Silver Nitrate.—Particularly adapted to the study of epithelial and connective tissues. Make a 1 percent solution in distilled water, and dilute from 2 to 4 times for use. Very thin sections of fresh tissue are washed in distilled water to remove the chlorids, immersed for 1/2 hour in the solution in the dark, washed in distilled water, and then placed in water and exposed to sunlight until brown. Fix in a solution of sodium hyposulphite in the dark, and mount in glycerin jelly.

Gold Chlorid.—Recommended for tracing nerve-endings in fresh tissues, and for staining connective tissue and cartilage cells. Place small pieces of tissue, 1/4 inch square, in from a 0.5 to a 1 percent solution of commercial gold chlorid in distilled water. Keep in the dark, and when the tissue has become yellow, wash in distilled water. Then expose to the light in 50 c.c. of water containing 2 drops of acetic acid for 48 hours, or until the tissue acquires a purple tint.

Osmic Acid.—Tissues fixed in osmic acid and subsequently treated with weak pyrogallic acid are stained greenish-black (Lee). It is a fixing reagent as well as a stain for fat or myelin. A 1 or 2 percent solution is used. A developing mixture of water, alcohol, tannin, and pyrogallic acid, or a 5 percent solution of tannin is used by Kolosson. Treatment with oxalic acid 1 part, in water 15 parts, gives a Burgundy-red stain to osmium objects, which should be washed in water before they are put into the acid.

Clearing Reagents.—These reagents are used for the purpose of rendering certain tissue elements more distinct. For this purpose acetic acid may be recommended in the strength of 2 to 5 parts of acid to 100 parts of water.

This reagent causes swelling of the ground substance, and facilitates the study of the nuclei, elastic fibers, fat, myelin, and microorganisms.

Other reagents are also used for the purpose of clearing tissues, but care must be exercised to select one which will not dissolve the anilin dye in the section already stained, and one which will clear it when celloidin is used. When either the celloidin or paraffin method is used, one of the following clearing reagents is recommended: oil of bergamot, or a mixture of oil of cloves 1 part, and oil of thyme 4 parts. When anilin dyes have been used, the best clearing reagent is xylol. It is to be preferred also in unembedded sections, and for paraffin sections that have been dehydrated in absolute alcohol. Other reagents are oil of lavender, oil of cedar, and anilin oil.

Mounting Reagents.—The best mounting reagent is Canada balsam, although dammar and colophonium are sometimes used.

Staining Methods.—Tissues are stained for the purpose of differentiating the tissue elements; to show bacteria; to present evidences of pathologic change in the arrangement of the tissues, and to show the affinity of tissue for special anilin dyes. The three principal tissue elements are (1) the cell, (2) intercellular substance, and (3) pathologic products.

The cell contains the nucleus, protoplasm, and cuticle. Within the *nucleus* may be seen the nucleolus, resting nucleus, and frequently bacteria. The *protoplasm* may show the centrosome and polar bodies, the different varieties of granules, dendritic processes of ganglion cells, axis-cylinder and terminal processes, contractile elements of striated muscle-fiber, red blood-globules, cilia of bacteria. Within the *cuticle* there may be seen certain dots in ependymal cells, cilia in certain renal cells, and bile capillaries.

In the intercellular substance may be studied the cement substance of endothelial cells; the ground substance of connective tissue; connective-tissue fibrillæ; myxomatous tissue; mucin; elastic fibers; intercellular substances of cartilage; ground substance of bone; myelin; neuroglia fibers; clubs of actinomyces, and capsules of bacteria.

Pathologic products may be shown after the staining process: as, for instance, the hyalin substance may be changed into substances such as fibrin, mucin, amyloid glycogen, hyalin colloid, keratohyalin, and eleidin. There may also be present fat, hemosiderin, hematoidin, or hemoglobin.

The tissue elements may be stained differentially in a number of ways, frequently one stain answering the purpose, while in others a series of stains may be required, depending upon the affinity of certain chemic constituents of the cell for certain dyes.

Nuclear Stains.—Probably the most serviceable stain for nuclei in general work is alum-hematoxylon, using eosin as a contrast stain. Such carmin stains as lithium carmin, followed by picric acid, have also been used.

Safranin is also highly recommended as a nuclear stain. Other nuclear stains are eosin, followed by methylene-blue, and Unna's alkaline solution of methylene-blue (methylene-blue, 1 part; potassium carbonate, 1 part; water, 100 parts).

Method.—(1) Stain for from 2 to 30 minutes; (2) wash in several changes of water; then leave the sections, if possible, for several hours or overnight in a large dish of water; (3) contrast stain usually an aqueous solution of eosin, 1/10 tol 1/2 of 1 percent, for 1 to 5 minutes; (4) alcoho, 95 percent, 2 or 3 changes to dehydrate and remove excess of contrast stain; (5) clear in oleum origani cretici, or in the mixture of oil of cloves and thyme; (6) mount in Canada balsam.

To Study Changes of Karyomitosis.—In studying these changes it is essential that the tissue be selected and fixed in one of the reagents at the earliest possible moment after its removal. For this reason the figures produced by mitosis cannot be so well studied when removed postmortem. A fixing reagent should be selected which penetrates quickly, such as safranin.

To Stain Karyokinetic Figures.—Fix the section in Zenker's or Orth's fluid, embed in paraffin, and stain with Babe's anilin safranin solution, prepared as follows: Two percent anilin water, 100; safranin O, soluble in water in excess. Saturate the solution by heating in a flask placed in hot water at a temperature of 60° to 80° C., and filter.

Method.—(1) Stain the paraffin section from a few minutes to an hour; (2) wash in water; (3) wash in 95 percent alcohol, to which are added a few drops of acid alcohol (hydrochloric acid, 1 c.c.; 70 percent alcohol, 99 c.c.); (4) wash in pure 95 percent alcohol, followed by absolute alcohol; (5) clear with xylol; (6) mount in xylol balsam (Canada balsam, 4 grams; xylol, a sufficient quantity to make a fluid having a syrupy consistency).

If the specimen is embedded in celloidin, clear the section in oil of bergamot or oleum origani cretici after the 95 percent alcohol, wash in xylol, and mount in xylol balsam.

Carbol-fuchsin and anilin gentian-violet may also be used in the place of safranin.

Staining of Bacteria in Tissues.—After embedding the section in the usual manner—by the paraffin method preferably—it is cut in a very thin section and attached to a slide by means of Mayer's glycerin-albumin mixture (equal parts of white of egg and glycerin). The best staining fluids are dilute aqueous or alcoholic solution of the anilin dyes, such as methylene-blue, gentian-violet, and fuchsin.

The sections should be heated moderately while being stained, either in a thermostat or over an alcohol lamp.

The decolorizing agent will vary with the stain employed. Those generally used are dilute acetic acid, 1 : 100 up to 1 : 1000, alcohol, iodin in potassium iodid solution, dilute mineral acids, chlorid of anilin, anilin, and ethereal oils.

Many pathogenic microorganisms require special staining fluids for their detection in the tissues, for further discussion of which see under their special heads, as GONOCOCCUS, PNEUMONIA, TYPHOID FEVER, etc.

Gram's Method.—Heat 2 to 5 minutes, or stain cold 20 to 30 minutes (tubercle bacilli, 12 to 24 hours), in saturated solution of gentian-violet anilin-water; rinse quickly in absolute alcohol; transfer to Gram's solution (1 to 1 1/2 minutes), in which the specimen turns black; wash in alcohol until the black color vanishes and a pale gray color appears; dry and mount in Canada balsam. The decolorization may be hastened by adding 3 percent nitric acid to the alcohol and then washing in pure alcohol. All the tissue cells are decolorized by this method, while the bacteria are stained a deep blue. The cells may subsequently be stained with a watery or alcoholic solution of Bismarck brown 2 to 5 minutes, then washed in absolute alcohol until the section is yellowish-brown. This method is of diagnostic value, as certain bacteria are stained, others decolorized, by it.

Bacteria that are Stained by Gram's Method.—Staphylococcus pyogenes aureus; streptococcus pyogenes; micrococcus lanceolatus (of pneumonia); micrococcus tetragenus; bacillus of diphtheria; bacillus of tuberculosis; bacillus of leprosy; bacillus of anthrax; bacillus of tetanus; bacillus aërogenes capsulatus; ray fungus of actinomycosis.

Of these the tubercle bacillus and the bacillus of leprosy require a much longer exposure to the stain than other bacteria in the list.

Bacteria that are not Stained by Gram's Method.—Gonococcus; diplococcus intracellularis meningitidis; micrococcus melitensis; bacillus of chancroids (Ducrey); bacillus of dysentery (Shiga); bacillus of typhoid fever; bacillus coli communis; bacillus pyocyaneus; bacillus of influenza; bacillus of bubonic plague; bacillus of glanders (bacillus mallei); bacillus of Friedländer; bacillus proteus; spirillum of Asiatic cholera; spirillum of relapsing fever.

Staining of Nervous Tissue.—The tissue elements to be studied in this structure are: (1) The ganglion cells, including the dendritic and axis-cylinder processes; (2) the myelin sheaths, and (3) the neurolgia fibers. Each requires special fixing reagents to be studied in detail. Formaldehyd (4 percent) has, however, been recommended as a fixing reagent for the preservation of all of these elements of nerve tissue.

Special stains are also required for each element: thus for the *ganglion cells*, Nissl's and Lenhossek's methods have been used.

For staining the *dendritic* and axis-cylinder processes, Golgi's slow or quick method is recommended.

For staining the *myelin sheath*, use Weigert's quick method or Pal's modification of Weigert's process.

For staining *neuroglia fibers*, use Weigert's or Mallory's method.

All of these processes are quite complicated and require very accurate manipulation in order to get the best results.

• **Transmission of Materials Containing Bacteria, in the Mails.**—The ruling of the Post-Office Department of the U. S. is as follows:

"That the order of the Postmaster General of December 27, 1897 (Order No. 677), amending Order No. 88 of February 5, 1896, prescribing the conditions under which specimens of diseased tissues may be admitted to the mails is hereby further modified in the following manner:

"Specimens of diseased tissues may be admitted to the mail for transmission to the United States, State, or municipal laboratories, only when enclosed in mailing packages constructed in accordance with the specifications hereinafter enumerated: Liquid cultures, or cultures of micro-organisms in media that are fluid at the ordinary temperature (below 45° C. or 113° F.) are unmailable. Such specimens may be sent in media that remain solid at ordinary temperatures.

"Upon the outside of every package shall be written or printed the words 'Specimen for Bacteriological Examination. This package to be treated as letter mail.' No package containing diseased tissue shall be delivered to any representative of any of said laboratories until a permit shall have first been issued by the Postmaster General certifying that said institution has been found to be entitled, in accordance with the requirements of this regulation, to receive such specimens."

The regulation includes not only cultures, but "specimens of diseased tissues." The specifications prescribing the manner of packing, which are minute and complicated, may be obtained from local postmasters.

PEDICULOSIS (Lousiness; Phthiriasis).—A contagious animal parasitic disease, characterized by the presence of pediculi, hemorrhagic points, and scratch-marks.

Varieties.—There are three varieties: (1) Pediculosis capitis; (2) pediculosis corporis; (3) pediculosis pubis.

Pediculosis Capitis.—Pediculosis capitis is due to the invasion of the scalp by the pediculus capitis, or head-louse. It is characterized by severe itching, which excites scratching and leads to the formation of excoriations with serous, purulent, or sanguineous exudation. This dries in the form of crusts and mats the hair together. A foul odor is usually present. Owing to the irritation, the postcervical glands may become enlarged, and in some cases suppurate. The occipital region is the most frequent seat of this particular dermatitis. Scattered papules, pustules, and excoriations are frequently seen about the face and neck. Pediculi are present in varying numbers, and ova or "nits" in abundance. Ova are grayish, translucent, pyriform bodies, attached to the hair by a membranous sheath, they hatch out in from 3 to 8 days. Pediculosis capitis is far more common in children than in adults.

Diagnosis.—Owing to the presence of the pediculi and the "nits," the diagnosis is, as a rule, easy. Every pustular eczema in the occipital region should be regarded with suspicion, and warrants a search for pediculi and ova.

Treatment.—The object of treatment is to kill the pediculi, devitalize the ova, and subdue the accompanying inflammation. Among the most popular and efficacious remedies are petroleum, either pure or with equal parts of olive oil, and balsam of Peru. They should be thoroughly applied to the scalp for 1 or 2 nights, followed in the morning by a shampoo of the scalp with soap and water or tincture of green soap. Other remedies, such as cocculus indicus, staphisagria (2 fluidrams to 4 fluidounces dilute acetic acid), or corrosive sublimate (1 to 4 grains to 1 fluidounce), may be employed.

When there are much pustulation and crusting, the following ointment may be applied:

℞.	Ammoniated mercury,	gr. xxx
	Petrolatum,	℥ j.

For the removal of "nits," alkaline solutions (such as carbonate of sodium, borax, etc.) or acid solutions (dilute acetic acid) should be applied frequently. There is rarely need of sacrificing the hair in women, although this may be done in children.

Pediculosis Corporis.—This is produced by the pediculus corporis or vestimenti, a parasite larger than the scalp louse. It resides in the seams of the underclothing, where the ova are deposited. They hatch out in about 6 days. The louse is merely present upon the skin when foraging. The perambulation of the parasite produces intense itching, which gives rise to violent scratching. As a result linear scratch-marks, blood crusts, and, in chronic cases, pigmentation and thickening may be seen. The parts affected are those coming in contact with the seams of the undergarments—namely, the scapular region, the chest, waist, and thighs. Hemorrhagic points mark the sites from which pediculi have extracted blood. The disease is common among the poorer classes in adults of middle or advanced age. It is rare in children.

Diagnosis.—The characteristic features are the presence of excoriations, nail-marks, blood crusts, and hemorrhagic points upon the scapular region and around the waist. Careful search in the seams of the undergarments will usually reveal the existence of pediculi.

Treatment.—The most important part of the treatment is the sterilization of the clothes and bed-linen. These should be thoroughly boiled or baked. A lotion of carbolic acid or thymol will relieve the itching quite effectually. When sterilization of the clothing cannot be carried out, it is best to prescribe an ointment of sulphur (1 dram to 1 ounce) or staphisagria (2 drams to 1 ounce).

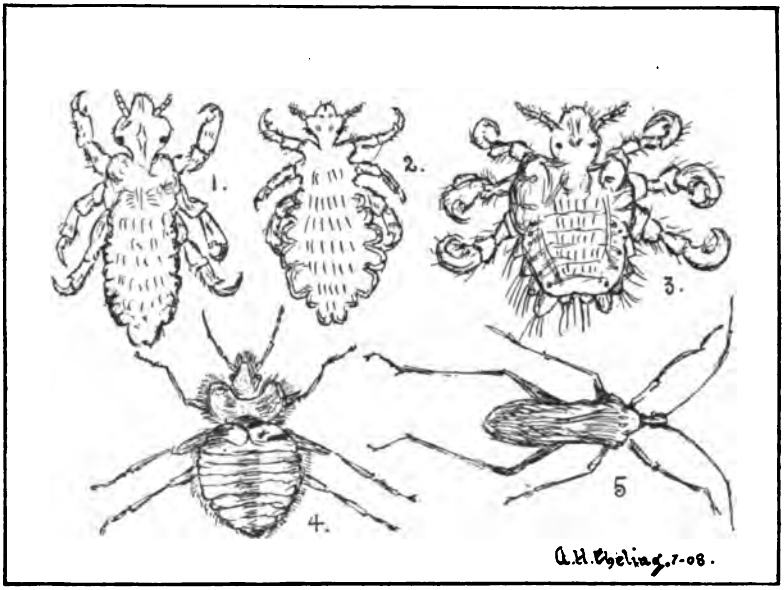
Pediculosis Pubis.—The pediculus pubis, or crab louse, is responsible for this form. It is the smallest of the pediculi, and is found clinging tenaciously to the hair with the head buried in the follicular orifice. The "nits" are seen attached to the hair-shaft. Itching about the genitalia, variable in degree, is the most prominent symptom. Hemorrhagic points, papules, and excoriations may also be present. The pubis and perineum are the usual regions involved. Occasionally the axillæ and sternal regions are attacked, and in rare cases the beard, eyebrows, or eyelashes. The disease is almost exclusively observed in adults, and is usually contracted during sexual intercourse.

Diagnosis.—The diagnostic features are itching about the genitalia and the presence of pediculi and ova.

Treatment.—The parts should be washed with soap and water twice daily. Lotions, being more cleanly than ointments, are preferable. Corrosive sublimate, the tincture of cocculus indicus, or the fluidextract of staphisagria are all excellent applications.

℞.	Fluidextract of staphisagria,	ʒ ij
	Dilute acetic acid,	℥ iij
	Distilled water,	℥ iij.

White precipitate ointment (1 dram to 1 ounce), or mercurial ointment, is effective. Vinegar, dilute acetic acid, and soda and borax solutions are of value in effecting the removal of the nits.



1. HEAD LOUSE. 2. BODY LOUSE. 3. CRAB LOUSE 4. BED BUG. 5. MEXICAN BED BUG.—(*Stitt.*)

PELIOSIS.—See PURPURA.

PELLAGRA. Synonyms.—*Malatie della miseria, Mal del sole, Pellarella,* Asturian leprosy, Alpine scurvy, *Mal rosso, Mal del padrone.*

Definition.—Pellagra is a chronic specific disease, probably infectious, characterized locally by erythema involving usually the exposed portions of the body surface and recurring from year to year during the summer months; characterized constitutionally by symptoms involving the gastro-intestinal tract and the mental and nervous systems.

History and Distribution.—The first authentic description of the disease as a distinct entity was written by Gaspar Casal, a Spanish physician, his monograph on the subject appearing in 1762, after his death. The disease was observed by him as early as 1735 and was described as "*Mal de la rosa.*"

His description of the disease was based on clinical observations among the peasants of the Asturias (Oviedo, Spain). In Italy, the first recorded reports appeared in 1700 (Ramazini) and 1740 (Pujati), but it was not until 1771 that serious attention was directed to the disease through the efforts of Frapolli. Though these are the first recorded reports of the disease, Sambon adduces abundant evidence in support of the supposition that the disease existed in Italy for several centuries prior to this time.

In Italy, the disease has always been most prevalent in the North—Piedmonte, Lombardia, Veneto—sweeping from the Julian Alps to the Piedmont Alps and from Lago Maggiore downward to the Arno. Within recent years, however, with betterment in general conditions, with the tremendous growth in industrial concerns, and with the extensive temporary emigration during the summer months, the disease has practically disappeared in Piedmont, and is rapidly decreasing in Lombardy and certain sections of the region of Venice.

The disease is extending to the south of Italy, and is to be found in Umbria, Tuscany, the Marche and the Abruzzi. In 1881, the number of pellagrins reported from Lombardy was 36,630. In the 1905 census this number had decreased to 15,746. In Umbria, Tuscany and the Marche, the official figures show an increase:

	1881	1905
Tuscany,	924	1137
Marche,	406	1436
Umbria,	872	4250

The disease is quite common in Spain, Portugal, the Tyrol, Austria-Hungary, Roumania, Servia, Bulgaria, and Asia-Minor; it has also been observed in India. Sandwith has reported its extensive prevalence in Egypt, and it occurrence in Southern Africa. On the Western Hemisphere it is to be found in North, Central and South America, Barbados, Jamaica and Porto Rico.

Though isolated cases were reported in the United States by Gray and Tyler in 1864, Sherwell 1883, Harris 1902 and Sherwell 1902, no widespread interest was manifested in the disease until 1907, at which time Searcy, of Alabama, and Babcock, of South Carolina, reported independently extensive outbreaks in institutions for the insane in Alabama and South Carolina. Since 1907 a rapidly increasing interest in the subject bas heen evinced and to-day—1911—the disease is reported from more than twenty states. Unfortunately, in many of the states in which the disease is most prevalent, there are no facilities for the determination of accurate statistics as to incidence and no accurate estimate can be made as to the prevalence of the disease. Could accurate statistic be obtained, there can be no doubt that the figures would show not less than 10,000 cases in the United States in 1910. The disease is most prevalent in the Southern United States—North and South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi, Louisiana. Siler saw in the State of Illinois approximately 200 cases in 1909 and 150 cases in 1910, and the disease is reported from other middle western states and California.

Etiology.—The specific agent producing pellagra is unknown. During the past century many theories have been advanced, among them the following: Insufficient nutriment, insolation, syphilis, poverty, insanitary surroundings, leprosy, alcohol, molds, bacteria, metazoa, maize, protozoa, etc.

All theories concerning etiology except the bacterial, maize, metazoal and protozoal may be dismissed as unworthy of comment.

Bacterial Theory.—Tizzoni has recently announced the isolation of a specific bacterium as the causative agent—namely, the *streptobacillus pellagræ*. Nichols and Siler failed to confirm this observation, notwithstanding the fact that they repeatedly attempted to cultivate microorganisms from the blood, spinal fluid and body organs, on various kinds of culture media. Many other observers in different sections of the United States have reported like results.

It has been suggested that the specific bacterium is present in the intestinal canal. This theory should be regarded with skepticism, as it is extremely difficult to harmonize with it the clinical picture of the disease, some peculiarities in its topographic distribution and more particularly some striking facts as to transmissibility. Should the specific agent prove to be an intestinal bacterium, the method of transmission is probably by water or by contact. During the summers of 1909 and 1910, Siler studied pellagra in an institution averaging more than 2000 patients, 350 of whom were pellagrins. Notwithstanding the facts that all patients and the large force of employees used the same water and that the nurses were thrown in intimate contact with the patients, not one case of pellagra developed in any of the attendants.

This has been the experience of Italian investigators and, with one exception, also of investigators in the United States.

Maize Theory.—This theory which has been advanced so positively by continental authorities, particularly Italian and Roumanian, assigns to Indian corn, of one sort or another, the rôle of principal etiologic factor. Adherents of this theory disagree as to just how and why corn products produce the disease.

1. *Sound Corn.*—It is asserted by one group of investigators that sound corn produces the disease, but opinions differ as to the actual exciting factor. Briefly, the following views are held: (a) Deficient nourishment with particular reference to nitrogen starvation in those subsisting, mainly, on a corn diet. (b) Toxic substances of various kinds, for example, toxins normally present in corn, toxins generated by the action of intestinal bacteria after the ingestion of corn.

2. *Damaged Corn.*—Another group asserts that damaged corn is the factor of principal import. Here, again, opinions differ, the following views being held: (a) Specific toxins are generated during the decomposition of corn. (b) Poisons are generated during the period of germination. (c) A specific poison is produced through the action

of *Penicillium glaucum* on corn. (d) Toxins are generated by the action on corn of certain fungi—namely, *aspergillus fumigatus* and *aspergillus flavescens*.

Italian investigators hold corn products responsible in great part on the following hypotheses: Pellagra followed the introduction of maize into Italy, and the extension of the disease was coincident with increase in area of corn cultivation. The disease occurs exclusively among people who subsist mainly on corn products and in districts in which corn is either cultivated or into which it is imported.

The Italians claim to have greatly reduced incidence and mortality rates in the endemic areas, by inspection of corn with condemnation and exchange of damaged lots; by the installation of drying apparatus; by the provision of proper baking ovens; by the compulsory notification of pellagrins to the health authorities; by supplying to all pellagrins corn-free meals twice each year for periods of not less than 40 days; by the issue of free salt to pellagrins and by the establishment of special hospitals—"Pellagrosarii"—for the treatment of this disease.

In 1905, Sambon suggested that corn was not the agent producing the disease; and in 1910 he further elaborated his hypothesis after an investigation of conditions in Italy. His investigations tend to refute all theories alleging a relationship between corn *per se* and pellagra.

In this connection it should be stated that Italians seem to have lost sight of pellagra in their investigations and have confined their researches almost exclusively to corn.

Sambon has presented quite conclusive evidence, that though pellagra was first described in Italy about the middle of the eighteenth century, it must have existed centuries prior to that time and has no coincident relationship with the introduction of corn from America; nor is there any definite proof to substantiate the supposition that corn was introduced into Europe from America.

The topographic distribution of pellagra does not coincide with that of corn cultivation and corn consumption. In Italy the disease is confined largely to endemic foci, and though corn is cultivated throughout certain provinces and the diet of the peasants throughout such districts consists almost exclusively of corn—"polenta"—it by no means follows that pellagra will be observed throughout such districts; on the contrary, the disease is frequently sharply limited to restricted areas.

The disease in Italy is almost, without exception, confined to the field laborer and is never found in cities, notwithstanding the fact that the peasant in cities subsists, in large measure, on "polenta." The disease has practically disappeared in certain provinces and shows marked decrease in others.

The claims put forward by Italian authorities in explanation of the decrease in the disease are subject to criticism. The laws providing for inspection, condemnation, and exchange of corn are in numerous instances a "dead letter." The use of a drying apparatus for extracting moisture is an unpopular measure, and is but seldom applied to home grown corn. The lists of cases notified to the health authorities as pellagrins are inaccurate and contain the names of many patients who are not pellagrins, while many actual cases of pellagra are not included. It is difficult and beyond reason to attribute any permanent or even temporary prophylactic benefit to the soup kitchen. These kitchens are open only for a fortnight in the spring and autumn, supply only a midday meal, are frequented largely by non-pellagrins, and many actual cases of pellagra (for various reasons), do not attend. The special hospitals for the treatment of pellagrins are few in number and admissions are confined largely to children.

It would seem more reasonable to attribute the decrease in the disease in Italy to other factors. The disease is intimately associated with field labor. In many sections there has been a marked increase in industrial pursuits and as the peasant changes his occupation from that of a field laborer to that of an operative in silk factories, cotton factories or other industrial concerns, the exposure to the probable transmitting agent necessarily becomes more remote.

It is also a fact that in many communes numbers of the inhabitants emigrate temporarily during the summer months to Switzerland, France, Austria, and other countries, for the purpose of engaging in tunnel and railway construction.

There can be no doubt that corn is not the etiologic factor in the production of pellagra, and this opinion is substantiated by experience with the disease in this country. Any one familiar with the extensive use of corn products in the Southern States, can well understand that the maize theory, pending thorough investigation, would be accepted as explaining the etiology of pellagra. Corn-meal, however, comparatively speaking, plays but an insignificant part as an article of diet throughout the remainder of the United States. During the summer of 1909 Nichols and Siler followed an outbreak of pellagra in an Illinois institution. The disease was apparently endemic, affecting about 200 of 2000 patients. It was possible to collect reliable statistics, covering a period of 4 years, as to the amount of corn products consumed. It was found that the average amount consumed per patient was less than 2 ounces daily and the corn products used were always fresh and of excellent quality.

To more thoroughly test the relationship of corn products to the disease a feeding experiment was instituted at the suggestion of Nichols to be continued for a period of 1 year. Two cottages, each with a capacity of 60 patients, were filled with selected nonpellagrins. In one cottage the diet included approximately 16 *ounces of corn-food-stuffs per day*, while in the control cottage a *corn-free* diet was instituted. The patients were carefully observed for a period of 1 year. The results reported by Watkins are as follows:

	Patients	Cases of pellagra	Suspects
Corn diet,	59	4	1
Corn-free diet,	58	5	3

The proportion of new cases developing in these cottages agrees practically with the percentage of new cases developing throughout the institution (2000 patients). Corn products were eliminated from the general diet of the institution in the summer of 1909.

Nichols has carried out extensive experimental inoculations on animals—rabbits and guinea-pigs—using extracts of cultures of various molds and bacteria grown on corn. His results were negative.

An attempt has been made to transmit the disease to animals—monkeys. No definite results have been obtained.

Metazoal Theory.—Quite recently—May, 1910—Prof. Alessandrini, of Italy, has recorded the finding of a nematode (Filaria?) as yet unclassified, in the skin of pellagrins and in the drinking water of endemic areas, to which he assigns etiologic significance. But other observers have failed to confirm this observation.

Long has recently (1910) suggested, as a working "hypothesis," that the entamebæ together with the inflammatory changes brought about by their action are the etiologic factors of importance. Nichols and Siler in 1909 directed attention to the strikingly large percentage of pellagrins presenting evidence of entamebic infection and were impressed with the fact that this infection was not an etiologic, but an important complicating and possibly predisposing factor.

Protozoal Theory.—In 1905 Sambon suggested that the disease is parasitic (protozoal) and in 1910 reiterated this opinion and further elaborated it by assuming that the disease is not only parasitic, but insect-borne and conveyed by some species of *simulium* (sand-fly). He bases his theory on the following facts: (1) The disease is parasitic for the reasons that: (a) the cutaneous and other symptoms usually recur periodically each spring for many years even though the patients remove from an endemic area and subsist on a corn-free diet; (b) its peculiarities in distribution, symptoms, chronicity and pathology correspond to those of other protozoal diseases (trypanosomiasis, kala-azar, syphilis). (2) The disease is insect-borne because: (a) it is not directly contagious; (b) infection through food or water does not explain its epidemiology; (c) it is limited to rural districts, being practically restricted to the field laborer. (3) The disease is conveyed by *simulium*, because: (a) the topographic distribution of the *simulium* and pellagra appear to be coincident; (b) the adult stage of the *simulium* apparently presents a seasonal incidence similar to pellagra; (c) the insect is found in rural districts only, but seldom entering houses or towns; (d) the only class of people constantly exposed to the bite of the *simulium* are field laborers; (e) the disease is practically confined to the field laborer, and (f) other similarly small blood-sucking flies are strongly suspected of being conveyors of disease—*phlebotomus, papatassi, dilophus febrilis.*

It seems quite likely that eventually the disease will be placed among those of parasitic origin, probably protozoal.

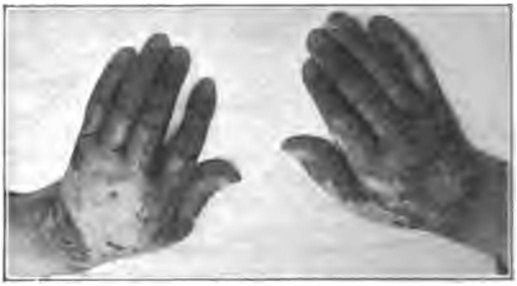
Clinical Description.—In attempting to outline the clinical picture of this disease, one is confronted by a multitudinous variety of symptoms enumerated by various authorities as making up the symptom-complex. Many of these symptoms, when analyzed, can definitely be ascribed to complicating factors and are of no diagnostic value in pellagra *per se*. The disease, under ordinary circumstances, is chronic, extending over a period of many years—about 4 to 25 or more. The incubation period is unknown. The disease is not hereditary.

An *acute typhoidal* type of the disease, of sudden onset and rapid course, usually ending in death, is referred to by many authorities. As such cases, however, are of rare occurrence and likely to be confounded with an exacerbation of a chronic condition, they do not merit classification as a distinct type.

The symptoms are cutaneous—involving more particularly the extensor surfaces; and constitutional—involving the gastrointestinal tract and nervous system. Prodromal symptoms—general malaise, vertigo, digestive disturbance, obscure epigastric pain and various other symptoms—are referred to by many authorities, but these symptoms are so indefinite in character and so inconstant in occurrence as to preclude reliable deductions for diagnostic purposes.

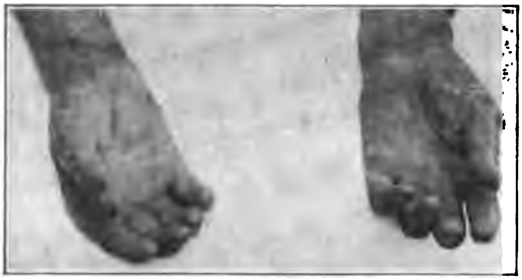
Cutaneous Symptoms.—The skin symptoms are by far the most striking, most constant, most characteristic and most important from a diagnostic standpoint. In their absence, a diagnosis of pellagra is unwarranted.

The eruption usually appears suddenly as an erythema, irregular in outline, involving most frequently the dorsal aspect of the hands. Its most characteristic feature is the symmetry of the lesions on both hands. The erythema may be confined to the dorsum of the hands, or extend downward to the finger-nails or upward on the forearm. Quite frequently it encircles the wrist as a more or less broad cuff and the exact similarity of the bands on both wrists constitutes a striking picture. The erythema, while most commonly observed on the dorsum of the hands, is by no means confined to this area. It is of frequent occurrence on the face, usually as symmetrical patches on the cheeks or forehead. Occasionally the entire face is involved—"pellagra mask";



SHOWING EDEMA OF HANDS. BLEB FORMATION OCCURRED, AND ILLUSTRATION SHOWS CONDITION AFTER BLEBS HAVE RUPTURED.—(*Reproduced by courtesy of Dr. George A. Zeller.*)

this has been observed in Italy but not (by Nichols and Siler) in the United States. The neck is frequently involved, the erythema appearing in symmetrical patches or occasionally encircling the neck as a broad or narrow band—"Casal's collar."



Showing Erythematous Cuff around Both Wrists and Slight Extension to Palm over Thenar Eminence. —(*Reproduced by courtesy of Dr George A. Zeller.*)

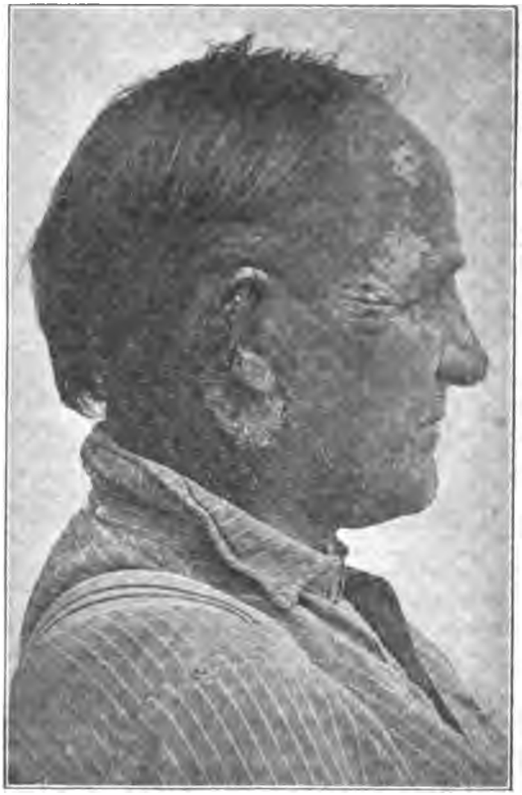
Triangular tongues of erythema, base above, are occasionally observed extending from the neck downward, in front or behind, depending greatly on the type of clothing worn. It not infrequently appears on the dorsum of the feet and as bands encircling the legs, particularly so if no shoes are worn. Occasionally reddish-brown patches, resembling hemorrhagic areas, appear on the upper and lower lids. The erythema in the early stages may easily be mistaken for a sunburn of moderate severity in mild cases. It may be differentiated by the fact that the sunburn clears up within 3 or 4 days, while the pellagrous erythema pursues a different course.

The color, at onset, depends largely on the type of patient affected. In blondes the color is first a bright pink, in brunettes usually a dull red. As the erythema progresses, the affected areas gradually take on a darker shade and within a few days show a characteristic purplish, dusky red color. In brunettes, the lesions are occasionally of a dark, greenish-bronze cast. At the onset of the erythema the color disappears on pressure, but later the contrary is the case. The line of demarcation between healthy skin and affected areas is usually distinct and clear cut. Ordinarily, the color begins to fade after about 10 days, and desquamation occurs. The exfoliation of epidermis may occur in fine scales or in large bran-like flakes. After desquamation is practically complete the skin is soft, smooth and pinkish in color, a distinct line of partially desquamated epithelium being noteworthy around the edges, showing distinctly the extent of the lesion. The entire course of the erythema and subsequent desquamation may occur within a period of a few days, but it usually lasts for a period of 3 or 4 weeks, or even longer. In some cases, edema of the affected area may be observed and occasionally vesicles appear. These vesicles frequently become confluent and may become infected. Nichols and Siler found the bleb formation to be a symptom of serious omen, and to bear an important relationship to prognosis.

Eventually the skin becomes pigmented and thickened, and as the erythema recurs from year to year this pigmentation is accentuated. After repeated recurrence of the erythema, atrophy of the skin occurs. The elbows and knees occasionally show evidence of erythema—pigmented, roughened, thickened skin. The genitalia are occasionally involved. Palmar involvement has been recorded by many observers. In observations covering several hundred cases in the United States and Italy, Siler saw this in only one case in which a complicating factor could not be excluded.

Pain is but seldom complained of in the sites of erythema, though a burning sensation may be present.

The erythema appears during the spring, summer, or autumn, more commonly spring and autumn. The exact time of its appearance depends largely on climatic conditions; being hastened by warmth, sunlight and settled weather conditions; and retarded by cold, rainy unsettled weather. Though the erythema may occur without exposure to sunlight, it is an undoubted fact that direct exposure to the sun's rays markedly accentuates the condition. During the winter it disappears.



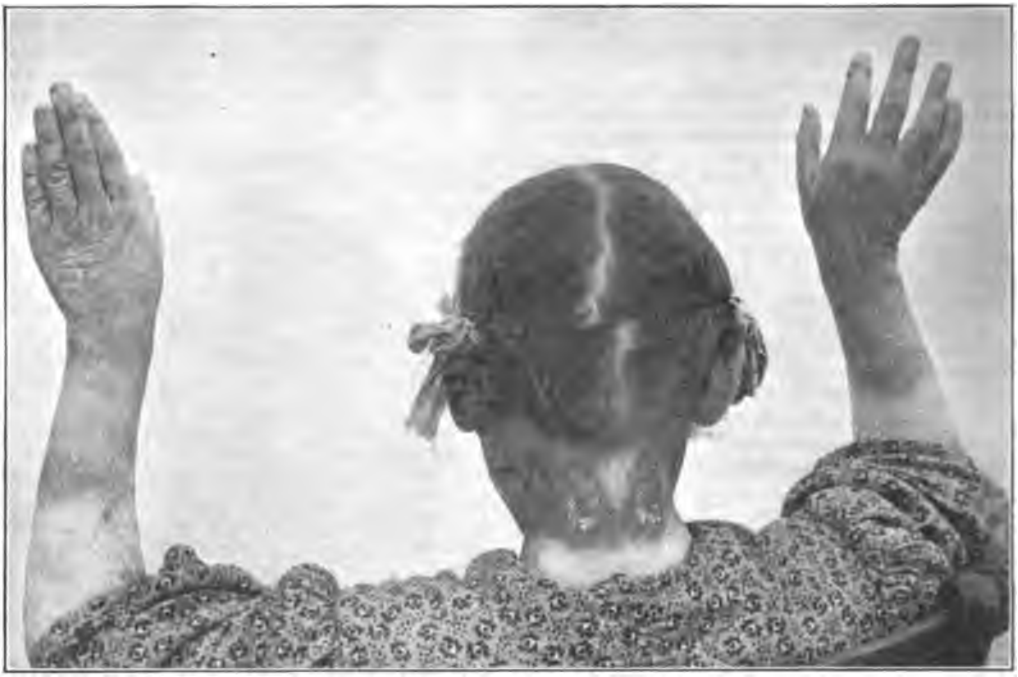
Pellagrous Erythema, Involving the Face and Neck. Desquamation Taking Place.—(*Reproduced by courtesy of Dr. George A. Zeller.*)

Constitutional Symptoms.—Gastrointestinal symptoms may or may not be present. Some writers go so far as to attribute important diagnostic significance to the appearance of the tongue and to a special odor noted in the diarrheic stools. Siler concludes that in some instances there are no gastrointestinal symptoms; while in many others these disturbances may be attributed to complicating factors, most frequently amebic dysentery. This complication has been referred to also by many observers in the southern sections of the United States, notably Allen and Long.

Among other complicating factors may be mentioned bacillary dysentery and various protozoal and zoo-parasitic intestinal parasites (flagellates and ciliates, uncinaria, ascaris, trichuris, schistosomidæ, etc.). In the absence of clear and definite cutaneous symptoms, it is inadvisable to attribute any great diagnostic importance to gastrointestinal disturbances.

Bearing in mind the fact that the digestive disorders may be due in large part to a complicating factor, they may be briefly summarized in the following manner: The patient may suffer from dyspeptic symptoms, as evidenced by coated tongue, poor appetite and flatulency. Frequently there is redness of the tongue with exfoliation of epithelium, giving rise to so-called "bald" tongue. The digestive disturbances may be accompanied by a mild transient diarrhea, by diarrhea of a more stubborn type or by severe dysentric symptoms—frequent small stools containing blood and mucus and of a highly offensive odor. None of these symptoms is distinctive of pellagra and may be accounted for by complicating factors (amebic and bacillary dysentery, etc.).

In the more severe manifestations of the disease the picture is characteristic, and it is evident that some specific agent is at work in addition to a complicating dysentery or other factor. The tongue is edematous and red; the buccal mucosa is intensely inflamed and dotted with ulcerating patches, and the gums are soft and spongy. There is swelling of the salivary glands accompanied by excessive salivation. The mouth symptoms may be so severe in character as to cause very intense pain, prevent protrusion of the tongue and interfere greatly with eating and drinking. The dysenteric symptoms in such cases are most pronounced and intractable. The gastrointestinal symptoms may precede, accompany or follow the cutaneous manifestations. Vomiting is seldom noted and vertigo is uncommon.



Note Symmetrical Erythematous Involvement of Hands, Forearms and Neck.—*(Reproduced by courtesy of Dr. George A. Zeller).*

Nervous and Mental Symptoms.—Symptoms referable to the nervous system may or may not exist, depending partly on the stage of the disease. Ordinarily during the first 3 or 4 years, nervous symptoms are indefinite in character and frequently absent. During the periodical recurrences there may be in the early stages mental depression, insomnia, irritability, headache, vertigo, tremors, languor and exaggeration of reflexes.

Complications in pellagra—(uncinariasis, amebic and bacillary dysenteries, tuberculosis, syphilis, bilharziosis)—are so frquent and the mental symptoms observed differ so markedly in character as to make it impossible to define with any degree of accuracy the nervous symptoms referable to pellagra.

As the disease progresses a small percentage of cases manifest involvement of the nervous system and some develop the so-called "pellagrous insanity." It is said that 10 percent of pellagrins in Italy develop this type of mental derangement.

In the later stages the mental depression frequently develops into profound melancholia with eventual terminal dementia. There may be periods of excitability alternating with stupidity, hallucinations, delusions of persecution and suicidal tendencies. Suicide by drowning is reported as common; but of the thousands of cases of pellagra in the United States, Siler was able to find only one instance in which this tendency was exhibited. The reflexes are said to be diminished or absent in the later stages; but in a series of 100 cases Siler found the contrary to be true, both the patellar and plantar reflexes being increased in a majority of cases. The Babinski reflex is sometimes present.

The facies in pellagra—a fixed, despondent appearance—is said to be typical, but in many cases this has not been confirmed. The final picture resembles closely that of general paralysis of the insane. Sandwith attributes diagnostic value to tenderness on pressure along the sides of the dorsal vertebræ (4th to 9th).

Differential Diagnosis.—In the presence of cutaneous lesions, it is quite unlikely that pellagra will be mistaken for other diseases. *Sprue* gives rise to somewhat similar mouth conditions, but the characteristic copious, whitish diarrheic stools, with no history of cutaneous lesions, will serve to differentiate. It has been compared to *leprosy*, but it is inconceivable that the two diseases can be confounded. *Weeping eczema* on the dorsum of the hands differs from pellagra in many respects—irregular outline of affected areas, peculiar color, itching, persistent serous oozing on stimulation. Both in the United States and Italy, *vitiligo* is mistaken for a pellagrous eruption; but scaling is not present in vitiligo.

Pathology.—The disease presents no uniform definite pathologic findings. Abnormal conditions observed can, in many cases, be attributed to complicating factors.

The blood, in uncomplicated cases, shows slight decrease in red cells and hemoglobin, and a relative increase in the mononuclear elements with slight leukocytosis. The anemia in uncomplicated cases is of low grade. Blood platelets are found in excessive numbers. Though prolonged and careful search has been made of both unstained and stained blood preparations, with one or two exceptions all observers have failed to demonstrate any bacterial or protozoal organisms. The Wassermann and Noguchi modification complement fixation reactions are negative in uncomplicated cases. A specific complement fixation reaction has been obtained by the use of liver from pellagrins as antigen.

The cutano-reaction with extracts of all grades of corn has been worked out by Hirshfelder with negative results. Stained preparations from the spinal fluid, liver and spleen show no organisms. There is decrease or absence of hydrochloric acid secretion in the stomach.

Necropsies frequently show serious concurrent diseases. Atrophy of the muscles, heart, liver and small intestines is found. The spleen is frequently small in size and shows atrophic changes. The large intestine frequently shows numerous undermined ulcers of the amebic type or well marked folliculitis. Various intestinal parasites may be present. The nervous system may show no pathologic change.

In chronic cases there may be diffuse leptomeningitis with scattered thickened areas, degeneration of the nerve elements with round celled perivascular infiltration, and an excess of fluid in the ventricles. The spinal cord frequently shows sclerosis of the posteromedian and posterolateral columns.

Harris has observed in chronic cases atrophy of the pancreas, softening of the cord, and degenerative changes in the myelin sheaths of nerves and of nerve cells of the gray matter and ganglia.

Prognosis.—In determining mortality rates in this disease, complicating diseases must be considered. Experience shows that, on necropsy, sufficient cause for death is revealed in many cases, exclusive of pellagra.

The death rate shows wide variation from year to year. It may occasionally rise to 25 percent, but usually is from 5 to 10 percent.

The disease occasionally results in death during the first attack. Ordinarily its course is extremely chronic—persisting for from 5, 10, 20, 30 or even 40 years, frequently without apparent detriment to the patient.

Entire recovery is not infrequent, but at least 2 or 3 years should elapse, without symptoms, before cure is pronounced.

Treatment.—At the present time, with our vague ideas as to the etiology of the disease, no satisfactory line of treatment can be formulated. The most rational procedure would seem to be symptomatic. In a general way improvement in hygienic surroundings and more liberal diet, with particular attention to the proteid constituents, are indicated.

Should complicating factors be present—amebic or bacillary dysentery, ciliate or flagellate diarrheas, bilharziosis, ascaris, trichuris or uncinaria infections—the treatment should be directed toward the eradication of these factors.

Cutaneous manifestations but seldom require treatment. Should local dressings be applied a protective dressing of borated zinc oxid ointment is appropriate. When erythematous areas become infected a wet dressing of some mild antiseptic—boric acid—is indicated.

Arsenic may be used internally—Fowler's solution or atoxyl. Should atoxyl be administered it should be exhibited in small doses by hypodermic injection—20 to 30 drops of a 10 percent solution every second or third day.

Nichols has used Ehrlich's "606" in one case without noteworthy immediate effect. It has been suggested by Bass that change of climate will bring about improvement. Direct transfusion of blood may be resorted to in extremely severe and hopeless cases.

Prophylaxis.—As our knowledge of the etiology of the disease is so indefinite, it is manifestly impossible to formulate any measures for prophylaxis.

PELLETIERIN TANNATE.—A mixture of the tannates of 4 alkaloids obtained from pomegranate; it is an effective teniafuge. Dose, 3 to 8 grains, in powder, taken fasting, and followed after 20 minutes by a full dose of castor oil. Pelletierin is actively poisonous, causing weakness of the legs. It is best administered in the form of Tanret's pelletierin, each bottle of which contains an adult dose. But the practitioner had better not prescribe this for poor people, as each dose costs *three dollars*! See ANTHELMINTICS.

PELLITORY.—See PYRETHRUM.

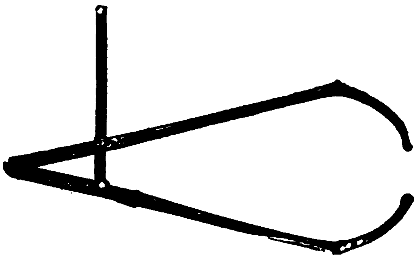
PELVIC INFLAMMATION.—See PUERPERAL FEVER.

PELVIMETRY.—The process of determining the size of the pelvis.

It is by no means desirable to subject every pregnant woman to the annoyance of a careful pelvic measurement. In private practice those patients should be measured who give a history of difficulty in former labors, or who are subjects of evident deformity, such as rachitis or kyphosis.

An accurate determination of the size of the pelvis necessitates both internal and external measurements. These measurements are made between certain well-defined bony prominences.

Pelvic Diameters.—The most important are the following: **Anteroposterior** (of pelvic inlet), that which joins the sacrovertebral angle and the pubic symphysis. **Anteroposterior** (of pelvic outlet), see COCCYPUBIC. **Coccypubic,** that which joins the tip of the coccyx with the subpubic ligament; the anteroposterior diameter of the pelvic outlet. **Conjugate,** the anteroposterior diameter of the pelvic inlet. **Conjugate, diagonal,** that connecting the sacrovertebral angle and subpubic ligament. **Conjugate, external,** that connecting the spine of the first sacral vertebra and the middle of the upper border of the symphysis pubis. **Conjugate, true,** that connecting the sacrovertebral angle and the most prominent portion of the posterior aspect of the symphysis pubis. **Oblique** (of pelvic inlet), left and right, that connecting one sacroiliac symphysis with the opposite iliopectineal eminence. **Oblique** (of pelvic outlet), that extending from the middle of the under surface of the sciatic ligament upon one side to the junction of the ischiopubic rami on the opposite side. **Sacropubic,** see ANTEROPOSTERIOR. **Sacrosubpubic,** see CONJUGATE, DIAGONAL. **Sacrosuprapubic,** that connecting the sacrovertebral angle and the upper portion of the symphysis pubis. **Transverse** (of pelvic inlet), that connecting the two most widely separated points of the pelvic inlet. **Transverse** (of pelvic outlet), that connecting the ischial tuberosities.



SCHULTZE'S PELVIMETER.

Size of the Pelvic Inlet.—Its transverse diameters are obtained by measuring between the anterior superior spinous processes of the ilia (26 cm.); between the widest divergence of the crests of the ilia (29 cm.), and between the two femoral trochanters (31 cm.).

The anteroposterior or conjugate diameter is obtained by measuring between the depression under the last lumbar vertebra and the upper edge of the symphysis (20 1/4 cm.). This is called the external conjugate diameter. A more reliable measurement is the internal conjugate diagonal. This is the measurement between the promontory of the sacrum and the middle of the subpubic ligament. It is obtained by passing the index and middle fingers of the left hand into the vagina in such a manner that the tip of the middle finger rests upon the top of the promontory of the sacrum. A mark is made on the upper surface of the hand, just where it presses against the under surface of the symphysis. The distance between this mark and the tip of the middle finger is the internal conjugate diagonal (12 3/4 cm.). The true conjugate is obtained from this diameter by simply subtracting 1 3/4 cm.

Size of the Pelvic Cavity.—This is determined approximately by a vaginal examination. Thus, a tumor obstructing the pelvic canal could easily be discovered in this way.

Size of the Pelvic Outlet.—This is rarely decreased except in kyphosis, when it is the transverse diameter that suffers. This diameter is measured between the two tuberosites of the ischia (11 cm.).

TABLE OF MEASUREMENT OF THE FEMALE PELVIS COVERED WITH THE SOFT PARTS.

Between iliac spines,	26	cm.
Between iliac crests,	29	cm.
External conjugate diameter,	20¼	cm.
Internal conjugate diagonal,	12¾	cm.
True conjugate, estimated,	11	cm.
Right diagonal,	22	cm.
Left diagonal,	22	cm.
Between trochanters,	31	cm.
Circumference of pelvis,	90	cm.

PELVIS, DEFORMITIES.—The pelvis is divided into two parts by the iliopectineal line. The shallow, expanded portion situated above this line is known as the **false pelvis.** It has very little influence on the course of labor.

The narrow, more contracted portion situated below the iliopectineal line is called the **true pelvis.** Contraction or deformity of this part of the pelvis may cause serious difficulty during childbirth. The shape of the pelvic inlet or superior strait is usually cordiform, the pelvic cavity is irregularly circular, and the outlet or inferior strait is cordiform. The pelvic cavity is lined with muscles, the most important of which is the iliopsoas. These muscles serve as cushions or protectors to the bony wall during labor, and also guide the presenting part in the most favorable direction for its expulsion. The pelvic floor, which almost completely closes the pelvic outlet, is formed chiefly by the levator ani muscle. This muscle, by the direction of its resistance, directs the presenting part upward and outward under the symphysis pubis.

For the measurements of the normal pelvis, see PELVIMETRY.

The frequency of pelvic deformity is about 14 percent. It is probable, however, that in not more than 5 percent is the deformity severe enough to seriously complicate labor.

The following is the most satisfactory classification of deformities of the female pelvis:

CLASSIFICATION OF DEFORMITIES OF THE FEMALE PELVIS, ACCORDING TO SCHAUTA.

A. ANOMALIES OF THE PELVIS THE RESULT OF FAULTY DEVELOPMENT.
  1. Simple flat.
  2. Generally equally contracted (*justominor*).
  3. Generally contracted flat (*nonrachitic*).
  4. Narrow funnel-shaped (*fetal* or *undeveloped*).
  5. Imperfect development of one lateral mass of the sacrum (*obliquely contracted* or *Naegele's pelvis*).
  6. Imperfect development of both lateral masses (*transversely contracted* or *Roberts' pelvis*).
  7. Generally equally enlarged (*justomajor* or *giant pelvis*).
  8. Split pelvis.

B. ANOMALIES DUE TO DISEASE OF THE PELVIC BONES.
  1. Rachitis.
  2. Osteomalacia.
  3. New growths.
  4. Fractures.
  5. Atrophy, caries, and necrosis.

C. ANOMALIES IN THE CONJUNCTION OF THE PELVIC BONES
  1. *Too firm union* (*synostosis*).
    (1) Of symphysis.
    (2) Of one or both sacroiliac synchondroses.
    (3) Of sacrum with coccyx.
  2. *Too loose a union or separation of the joints.*
    (1) Relaxation and rupture.
    (2) Luxation of the coccyx.

D. ANOMALIES DUE TO DISEASE OF THE SUPERIMPOSED SKELETON.
  1. Spondylolisthesis.
  2 Kyphosis.
  3 Scoliosis.
  4. Kyphoscoliosis.

E. ANOMALIES DUE TO DISEASE OF THE SUBJACENT SKELETON.
  1. Coxalgia.
  2. Luxation of one femur.
  3 Luxation of both femurs.
  4. Unilateral or bilateral club-foot.
  5. Absence or bowing of one or both lower extremities.

Contracted Pelvis.—Only the commoner varieties of contracted pelves will be considered. These, as found in this country, are:

1. The generally equally contracted pelvis.
2. The simple flat pelvis.
3. The rachitic flat pelvis.
4. The kyphotic pelvis.
5. The obliquely contracted pelvis.

The generally equally contracted pelvis is, as its name implies, a pelvis in which there is proportionate contraction of all its diameters. This contraction very rarely exceeds 2 or 3 cm. This pelvis is the result of arrested development at an early period of life. It has been thought to be due to a mild degree of rickets which has passed away rapidly, leaving no characteristic deformity.

The diagnosis of this variety of contracted pelvis is easily made by noticing the proportionate degree of contraction of the different pelvic measurements.

The mechanism of labor in the generally equally contracted pelvis differs but slightly from the normal. Vertical flexion at the inlet is somewhat exaggerated, while there is little or no lateral flexion.

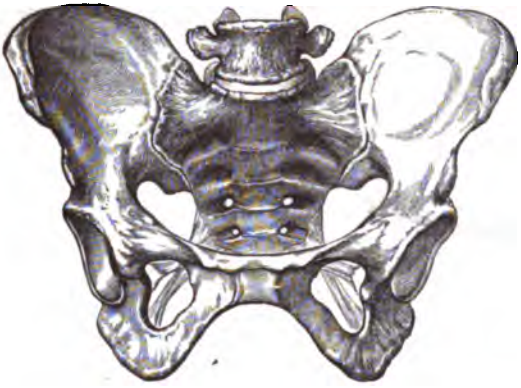
The treatment of labor obstructed by this variety of pelvis will depend upon the degree of contraction. If the true conjugate diameter measures 9 1/2 cm. or over, delivery at term with forceps should be comparatively easy. With a contraction between 8 and 9 1/2 cm., the induction of premature labor is advisable. This, supplemented by the use of forceps, if necessary, will be found almost uniformly successful. When the contraction is below 8 cm., choice will have to be made between symphysiotomy, cesarean section, and craniotomy.

The simple flat pelvis is one in which there is shortening of the anteroposterior diameter, the other diameters being normal. The amount of contraction very rarely exceeds 3 cm. It may be congenital in origin, or it may be caused by carrying heavy weights during early childhood. In this variety of pelvis the external conjugate diameter will be less than 20 1/4 cm., probably 18, or even 17; the true conjugate will be less than 11 cm., probably as low as 8. The other pelvic measurements will practically be normal.

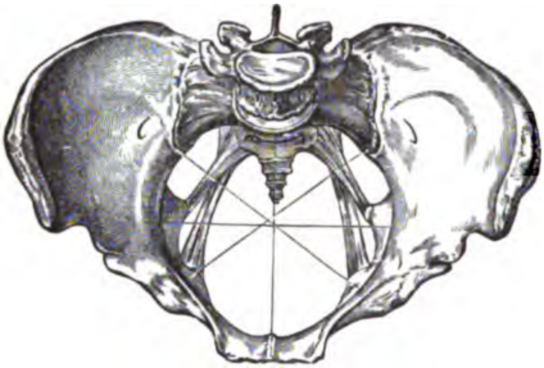
The rachitic flat pelvis is one of the results of infantile rickets. In this disease there is a diminution of the mineral constituents of the bones, which results in a preternatural pliability. There is a tendency, therefore, to an exaggeration of the changes which occur in the development of an adult from an infantile pelvis—*i.e.*, there is excessive rotation of the sacrum on its transverse axis. This results in an abnormal projection of the promontory, which causes a decrease in the conjugate diameter, an increase in the curve of the sacrum, a decrease in the depth of the pelvis, and a widening of the iliac spines and crests. The true conjugate diameter may be as low as 4 cm.

Diagnosis.—This pelvis is recognized by the marked decrease in both internal and external conjugate diameters; by the disturbance of the relation between the iliac spines and crests, the distance between the crests being almost or fully as great as between the spines; by the marked sinking of the depression under the last lumbar vertebra, it being now almost on a level with the posterior superior iliac spines; and by the accompanying constitutional signs of rickets.

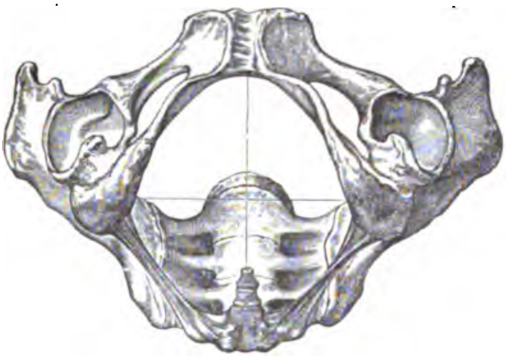
The mechanism of labor in the simple flat and in the rachitic flat pelvis is the same. The long diameter of the head engages in the longest diameter of the pelvis, which is now the transverse; there is exaggerated lateral flexion of the head, so that it may adapt itself to the increased sacral curve; and there is imperfect vertical flexion, so that the bitemporal diameter (8 cm.) may first be brought in relation with the contracted conjugate instead of the biparietal (9 1/4 cm.).



Female Pelvis, Seen from the Front.



Female Pelvis Viewed in the Axis of the Brim, Showing the Diameters of the Superior Strait.

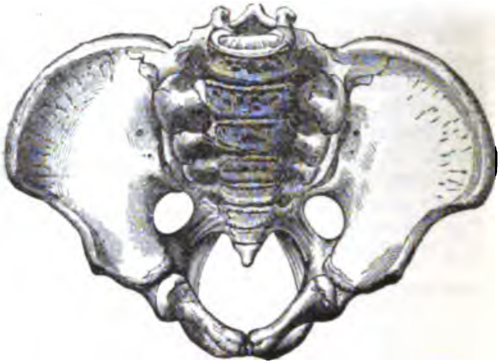


Outlet of Pelvis. Anteroposterior and Transverse Diameters of Outlet seen from Below.

The **treatment of labor** complicated by a flat pelvis depends upon the degree of contraction. Four grades are usually recognized:

1. When the true conjugate measures 9.5 to 11 cm. Here it is advisable to allow the patient to proceed to term. A rather prolonged and difficult labor should be expected, with perhaps malposition of the child or prolapse of the cord. If, after waiting a reasonable length of time, the head will not engage, version should be performed; if the head engages, but further delivery ceases, forceps should be employed.

2. When the true conjugate measures 8 to 9.5 cm. If the patient is seen in time, labor should be induced at the thirty-sixth or thirty-eighth week of gestation. If, now, there is difficulty in delivery, or if the patient is not seen until term, version or forceps, as previously described, will usually prove successful.



Infantile Pelvis, Viewed in the Axis of the Brim.

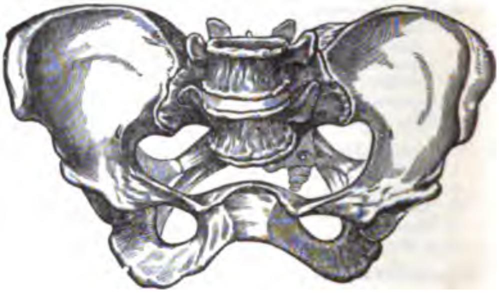
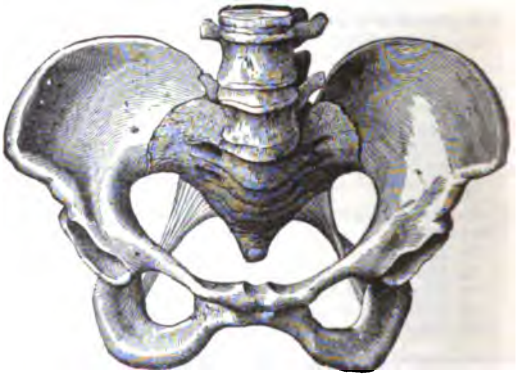


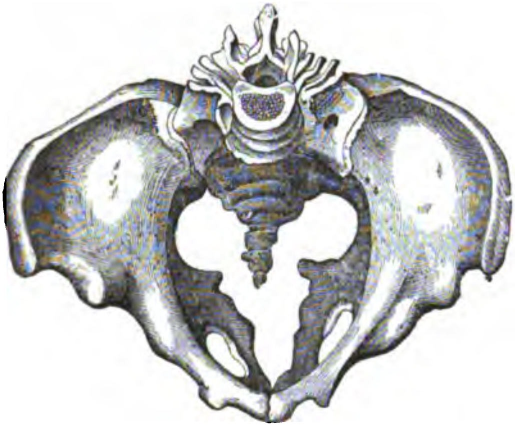
Figure-of-eight Rachitic Pelvis.

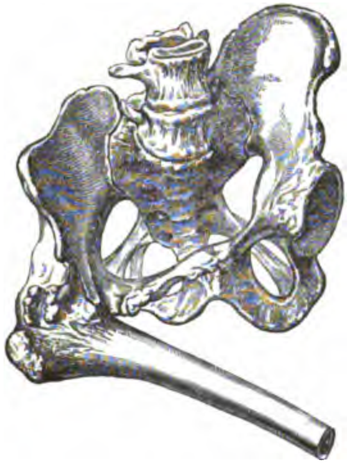


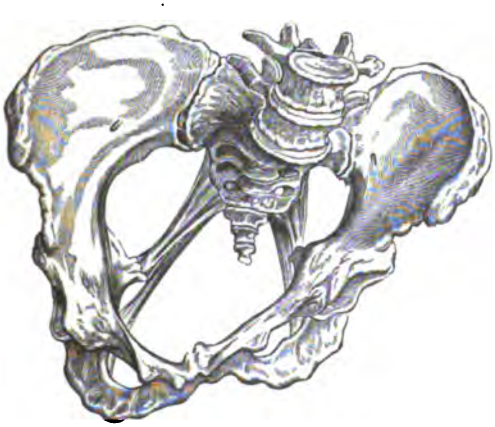
Reniform Rachitic Pelvis.

3. When the true conjugate measures 6.5 to 8 c.m Here one of the graver obstetric operations

is indicated. Choice must usually be made between symphyseotomy, cesarean section, and craniotomy. It should be remembered, however, that spontaneous birth may occur even with a contraction as low as this, and also that version or forceps may prove successful. The size and compressibility of the child's head and the strength of the uterine contractions are factors which must not be overlooked in the treatment of a contracted pelvis.

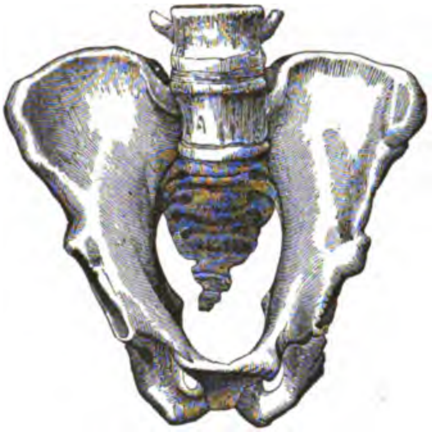

Kyphotic Pelvis.

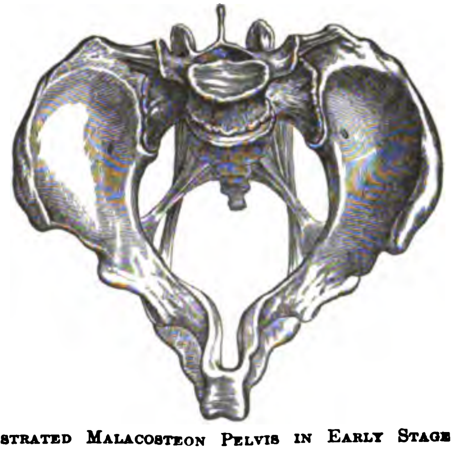

Oblique Pelvis, from Ankylosis of the Hip-joint and Disuse of the Right Leg.


Oblique Pelvis of Naegele.

4. When the true conjugate measures less than 6.5 cm. This is an absolute indication for cesarean section, since it would be dangerous to pull even a mutilated child through such a degree of contraction.

The kyphotic pelvis is that variety of pelvic deformity resulting from Pott's disease of the lower spinal column. In this deformity the promontory of the sacrum is pushed backward and the conjugate diameter at the pelvic inlet is slightly increased. The deformity is most marked at the pelvic outlet; the transverse diameter is markedly decreased by approximation of the ischial spines, and the conjugate diameter is somewhat lessened by forward displacement of the coccyx.


Transversely Contracted Pelvis of Robert.


Rostrated Malacosteon Pelvis in Early Stage of Deformity.

The diagnosis is easily made by the marked decrease in the transverse diameter at the outlet and by the associated kyphosis with its characteristic signs.

The mechanism of labor in this variety of pelvic deformity may differ but little from the ordinary.

Posterior rotation is frequent; also, the first stage of labor may be precipitate, while the second stage is abnormally slow.

Treatment.—Here, again, the treatment depends upon the degree of contraction. If the contraction of the transverse diameter is slight—not below 8 cm.—spontaneous delivery may be expected. With a greater degree of contraction than this, choice will be made between the induction of premature labor, forceps, symphysiotomy, cesarean section, and craniotomy.

The obliquely contracted pelvis is due to a variety of causes, such as scoliosis, coxalgia, club-foot, the absence of one extremity, and dislocation or fracture of one limb. The pelvis becomes obliquely contracted from the overuse of one limb, or, in the case of the scoliotic pelvis, from unequal pressure from above. The diagnosis is easily made by the presence of the marked asymmetry of the pelvis, associated with one of its various causes. Unless the deformity is marked, no treatment is necessary. Marked degrees of contraction will require forceps, version, the induction of premature labor, symphyseotomy, cesarean section, or craniotomy.

PELVIS, INJURIES.—**Fracture of the pelvis** is usually the result of direct violence—a heavy fall, a cart-wheel passing over the pelvis, a squeeze between the buffers of two railway cars, and similar accidents. It may, of course, result from gunshot wounds or from indirect violence, as when a person falls from a height and alights on his feet.

The symptoms are inability to walk, though the patient may be able to move his limbs in bed; mobility and crepitus, obtained by pressing on both crests of the ilium; pain on moving or coughing; displacement, which may be recognized by external examination, by the rectum, or by the vagina. Inability to empty the bladder or voiding of bloody urine denotes some injury of this organ.

Fracture of the acetabulum is indicated by the crepitus elicited on rotating the femur with one hand placed over the trochanter.

Separation of the symphyses, or of the **sacroiliac articulation,** is recognized by the free mobility of the part, and at the same time an interval may be felt in the situation of the separation. The pelvic viscera are frequently injured in this fracture; rupture of the bladder or urethra, giving rise to extravasation of urine, laceration of the rectum or of the larger blood-vessels, may occur.

Usually the rami of the pubes and ischium are the seats of fracture. The line of fracture may pass above the acetabulum in various directions, or it may involve the acetabulum, fissuring its floor or fracturing its margin. The acetabulum may be comminuted, and the head of the femur driven into the pelvic cavity. Any portion of these bones may be broken, including the crest of the ilium or the tuberosity of the ischium, and not infrequently both innominate bones.

Treatment.—Absolute rest of from 6 weeks to 2 months is essential. The pelvis must be bound around with a broad roller-bandage, and the patient laid to rest on a flat bed or mattress. The thighs must be flexed upon the abdomen and supplied with pillows under the knees.

Fracture of the acetabulum must be treated by means of a long splint, or hip splint of gutta-percha, molded to the side of the pelvis and thigh so as to fix the joint. A catheter should be introduced to ascertain the state of the bladder If bloody urine or other symptom of injury to this organ or to the urethra is present; the catheter must be kept in the bladder to prevent extravasation. See BLADDER (Injuries).

PEMPHIGUS.—Pemphigus is an acute or chronic inflammatory disease of the skin, characterized by the formation of successive crops of variously sized, rounded or oval bullæ, affecting seriously the general health and often terminating fatally.

Symptoms.—There are two principal types—pemphigus vulgaris and pemphigus foliaceus.

Pemphigus Vulgaris.—With or without febrile disturbance, there appear upon the limbs, face, or trunk, pea-sized to egg-sized, rounded or oval, tense blebs. These rise abruptly from the normal skin, and, while having at times a slightly reddened base, have no areola. The contained fluid is at first serous, later becoming turbid and purulent. The eruption occurs in crops, a half of a dozen or more blebs appearing at a time. These persist for a few days (the fluid disappearing by absorption or rupture), and are then followed by another crop. The parts most frequently affected are, in their order of frequency, the limbs, the face, and the trunk. The mouth, vagina, conjunctiva, and other mucous membranes may become involved. The disease in some cases runs a more or less acute course, getting well in a few months. Far more frequently, however, it persists for years, greatly impairing the general health.

Pemphigus Foliaceus.—In this form the blebs, which are flaccid and purulent, rupture before distention and dry to crusts, which are thrown off with the surrounding epidermis, exposing to view the reddened corium. A new crop of blebs succeeds the old, often developing upon the same site, and giving to the skin the appearance of a severe scald. The entire cutaneous surface may thus become involved, and the general health seriously compromised. The process lasts for months or years, and almost always leads to a fatal termination.

Neumann has described a rare form of pemphigus, characterized by the development of wart-like or papillary vegetations upon the sites of ruptured bullæ. This form he has called **Pemphigus Vegetans.** The mouth, vagina, or other mucous membranes are often first affected. The favorite situations upon the skin are the genital and anal regions, the neck, axillæ, and flexures of the extremities. The affection lasts months or years, and tends to a fatal termination. The subjective phenomena in pemphigus are itching and burning (usually moderate in degree), and often tenderness, pain, and a feeling of tension. The disease is distinctly rare, particularly in this country.

Etiology is obscure. The disease has been observed in many cases in which marked changes in the central and peripheral nervous systems were noted. In addition, mental strain, nervous exhaustion, and a lowered or vitiated state of the general health are considered to be causative.

Pathology.—The blebs are usually situated between the horny layer and the rete mucosum, but may occur at any depth in the epidermis. The contents of the bullæ consist of a slightly alkaline serum containing a few leukocytes. There is dilatation of the papillary vessels, and a leukocytic infiltration of the papillæ, corium, and subcutaneous tissue. The affection is looked upon as a trophoneurosis.

Diagnosis.—It should be remembered that all bullous eruptions are not pemphigus. Care should be exercised to differentiate the bullous forms of erythema multiforme, dermatitis herpetiformis, impetigo contagiosa, and syphilis (pemphigus syphiliticus of the older writers). The blebs of pemphigus are large, tense, abruptly elevated, noninflammatory, and come out in crops. These characteristics, with the history and course of the disease, should enable one to make the diagnosis.

Prognosis.—The course of the disease is uncertain. Mild cases may recover after a duration of months. Severe cases (particularly pemphigus foliaceus) are likely to end fatally. The occurrence of flaccid or hemorrhagic blebs, extensive cutaneous involvement, frequent outbreaks, or constitutional depression are all unfavorable signs.

Treatment.—Both internal and local treatment are to be employed, the former alone, however, being curative. Arsenic is by far the most valuable remedy. It is to be perseveringly tried, beginning with small doses and increasing until the physiologic limit is reached. Quinin in full doses is also of value, as are, at times, iron, strychnin, and cod-liver oil. Nutritious food, good hygiene, and bodily and mental rest are important therapeutic factors.

Local treatment is designed to heal the abraded surfaces and relieve the subjective symptoms. The blebs should be evacuated, and simple dusting-powders, ointments, or lotions applied. The calamin lotion is a most grateful application. Bran and starch baths are useful in extensive cases. In pemphigus foliaceus the continuous bath is perhaps the best treatment, the patient living day and night, for weeks and months, immersed in water.

PENIS, DISEASES.—**Inflammation** is usually the result of injury or associated with venereal disease. Cuts, twists, "breaking" a chordee, ligation of the penis, or forcing rings over it, passage of instruments, and impactions from calculi are the ordinary injuries. Injuries to the perineum may result in inflammation of the penis from extension. Excessive sexual intercourse or persistent masturbation are causative agents in inflammation. It may be a sequel to the exanthems and diphtheria. It is also found in gouty and diabetic subjects.

The treatment follows the general treatment of inflammation, with especial regard to the cause or condition in connection with which the inflammation has arisen.

Herpes of the penis is a vesicular eruption, occurring on the cutaneous or mucous surface of the prepuce, and running its course in about a week, but being liable to recur at stated intervals. Its recognition is important, because its appearance after doubtful intercourse may lead to improper treatment. A sedative lotion and the avoidance or prevention of all irritation are all that are needed in treatment. See CHANCROID.

Priapism.—The condition of temporary and functional fulness and firmness of the penis, clitoris, etc., due to sexual excitement, friction, spinal irritation, etc. The mechanism consists in an overfilling of the blood-vessels with an inhibition of the return circulation.

Treatment.—Hyoscin hydrobromid, 1/120 to 1/60 grain at bedtime, will prevent erections and check emissions. Belladonna in gradually increasing doses brings good results. Camphor often succeeds, while potassium and sodium bromids are especially sedative in irritable states of the genitourinary organs in which erections occur. Chloral, given at bedtime, may be repeated every night. A few drops of a 4 percent solution of cocain upon the glans penis often promptly controls an erection. Cold applications are of value. The anaphrodisiacs lower the sexual appetite and depress the genital centers in the brain and cord. See ANAPHRODISIACS, CHORDEE, GONORRHEA.

Deformities.—The roof may be defective (epispadias); or the floor (hypospadias); or the invagination that forms the fossa navicularis may fail to meet the part behind. If the urethra is imperforate, the kidneys become cystic, and the child dies at or before birth. Usually, however, there is hypospadias, and occasionally the two channels run one above the other for a considerable distance.

Hypospadias.—The orifice is usually at the base of the glans, or a little further back; the frenum is absent; the prepuce forms a great fold on the dorsum like a caul, and the corpus spongiosum possesses scarcely any erectile tissue. In other cases it lies at the end of the membranous urethra, the bulb and the scrotum failing to unite in the middle line, and forming labia, as in the female. When the defect is slight, the fossa navicularis may run back and end blindly; in other cases the penis is small, and the corpus spongiosum, if it is developed, incapable of erection.

Epispadias.—The complete form is always associated with ectopia vesicæ; occasionally the urethra opens behind the corona, the rest of the penis being well developed.

The treatment is not very promising. If the defect is slight, and micturition not impeded, it is better not to interfere. The orifice should be dilated to prevent any strain upon the structures behind; and if the urethra fails in front, so that it is impossible to direct the stream, an attempt should be made to carry it forward by means of a plastic operation. The flap must be double, so that a cutaneous surface may face the new channel; the deeper layer is taken from the side of the penis near, and twisted round upon itself; the superficial one borrowed from the redundant prepuce, the center of the caul being dissected up, and the glans thrust through the opening, so that the dorsal surface becomes inferior, or *vice versa*, as the case may be.

Phimosis may be congenital or acquired, following balanitis, soft sores, chancre, or injury. In the former case the glans is often adherent, and the orifice may be reduced to the size of a pinhole, so that the prepuce swells out with each act of micturition. Circumcision should always be performed, unless the corona can be thoroughly and easily exposed; the secretion collects inside; there is a constant risk of balanitis and paraphimosis; preputial calculi may form; and the liability to syphilis and phagedena is much greater. If gonorrhea occurs, it is more severe, and the constant irritation undoubtedly favors carcinoma.

Circumcision.—In the operation of circumcision the prepuce is drawn well forward, and clipped with a pair of polypus forceps in front of the glans; the projecting end cut off; the cutaneous sheath allowed to retract, and the mucous membrane slit up along the dorsum as far as its attachment. Each half is then cut away, following the line of the corona, and leaving the frenum and just enough to hold a few sutures. If catgut is used, and the wound dried and covered with iodoform, the dressing may remain on until the skin has united.

Paraphimosis is the condition produced by forcing the glans through the orifice of the prepuce when it is too narrow to admit it. The immediate result is congestion and inflammation, ending, if left, in ulceration and sloughing. The glans becomes swollen; the prepuce overhangs it like an edematous collar, and concealed behind this is a tight, unyielding ring formed by the orifice. In early cases reduction can usually be effected by oiling the parts well, and drawing the foreskin forward with the index- and middle fingers of the two hands, while the thumbs compress the glans; or the penis may be wrapped round with lint, and gently squeezed in the hand until the edema disappears; but in cases that have already lasted some days, it is often necessary to slip the end of a director under the constricting band on the dorsum, and divide it with a bistoury.

Epithelioma.—Squamous epithelioma is not uncommon after middle life, commencing on the glans or the inner surface of the prepuce, especially in cases of phimosis. It usually begins as a warty nodule, which soon breaks down into an ulcer, with intensely hard base and edges. If allowed to remain, the growth spreads rapidly, owing to the constant irritation of the urine; the corpora cavernosa and the glans are quickly infiltrated; the lymphatics in the groin become involved, and secondary deposits follow. The diagnosis from syphilis rests chiefly on the character of the base, which is covered with decaying epithelium, and the intense induration beneath and around.

Treatment.—**Amputation** is the only treatment. Until recently this was accomplished either with a single sweep of the knife, or more deliberately, forming a flap of skin to cover the surface of the wound, leaving the corpus spongiosum and the urethra longer than the rest, and stitching the edge of the mucous membrane to that of the skin. Recurrence, however, is exceedingly common after this operation; cicatricial stricture at the orifice invariable; and all power of directing the stream of urine lost. To avoid this, Thiersch recommends an oval incision round the root of the penis, prolonged a little backward in the median raphe of the scrotum, and then dissecting off the whole of the corpora cavernosa from the rami of the pubes and the triangular ligament. The corpus spongiosum and the urethra are dealt with separately, through an incision in the median line of the perineum behind, as much being removed as appears desirable, and the rest sutured to the skin in front of the anus. Micturition must, of course, be effected in the sitting posture, but there is not the same tendency to the formation of stricture, and there is much further freedom from return of the growth.

Benign Tumors.—Of these there are cystic, vascular, fibrous, horny, fatty, sebaceous, and other new growths. The most common are the papillomata or warty growths, which are associated chiefly with venereal disease. They may arise from uncleanliness, especially if the prepuce is long. They constitute a "cauliflower" mass, and sometimes completely cover the mucous surface of the glans and prepuce. Removal by scissors, or by torsion with forceps, is a most speedily effectual treatment. Repeated applications of zinc, calomel, tannic acid, burnt alum, or the pressure of dry lint between the foreskin and glans may suffice. Cleanliness is essential.

PENNYROYAL.—See HEDEOMA.

PEPO.—Pumpkin seed. The ripe seed of *Cucurbita pepo*, with properties due to a resin contained in the inner covering of the embryo. Dose of the resin, 15 grains; of the seeds 1/2 to 1 1/2 ounces, made into a suitable emulsion.

It is efficient and harmless used as a vermifuge against the tape-worm. The husks should be removed and the remainder rubbed into an emulsion with water, or into an electuary with sugar, should be taken on an empty stomach, and followed in 1 or 2 hours by an active purge. See ANTHELMINTICS, WORMS (Tape-).

PEPPER.—See PIPER.

PEPPERMINT.—See MENTHA PIPERITA.

PEPSIN.—A name for the hypothetic digestive principle in the gastric juice, unknown as a definite body. All preparations vary much. Pepsin forms either a fine, white or yellowish-white, amorphous powder, or thin, translucent scales or grains, free from any offensive odor, soluble in about 100 parts of water, more soluble in water acidulated with hydrochloric acid, but insoluble in alcohol, ether, or chloroform. It should never be alkaline. Commercial pepsin is obtained from the rennet bags of sheep or the stomachs of pigs. It is precipitated by sodium chlorid, lead acetate, or by drying the peptones on glass plates. Alcohol also precipitates it. **Saccharated pepsin** consists of 1 part pepsin, triturated with 9 parts of sugar of milk. One part should digest at least 300 parts of egg-albumen. The dose is 5 grains to 1 dram, given shortly after meals. **Liquid pepsin** contains 40 parts of saccharated pepsin, 12 of hydrochloric acid, 400 of glycerin, and enough water to make 1000 parts. The dose is 2 to 4 drams, after meals.

Every manufacturer of pepsin has his own preparation, with his peculiar name, but all preparations have in some degree the power of digesting albumin or fibrin.

Pepsin is a ferment, not a solvent; it converts casein, albumin, fibrin, and other albuminoids into peptones for assimilation, being aided by lactic and hydrochloric acids. It should be given within 2 or 3 hours after taking food. Its activity is destroyed by alcohol, and alkalies and many mineral acids precipitate it. It is chiefly employed in dyspepsia, and in apepsia of infants, gastralgia, anemia, chlorosis, gastric ulcer and cancer, infantile diarrhea, and in the vomiting of pregnancy.

It is added to rectal enemata of nutritive character, and when injected into fatty tumors or morbid growths homologous to the tissues, may arrest their growth and promote absorption. Among the laity it is a much overrated remedy for indigestion. Pancreatin is usually of more service.

In indigestion with atony:

℞.	Strychnin,	gr. 1/24
	Powdered pepsin,	gr. x
	Powdered starch,	gr. vij.

Give at 1 dose.

PEPTONIZED FOOD.—This is indicated when the natural digestive powers are enfeebled or suspended. In gastric catarrh, with pain and intolerance of food, in gastric ulcer, in anorexia and dyspepsia associated with valvular heart-disease, and in pyloric and intestinal obstruction, in defective nutrition and intestinal irritation, it is serviceable. Peptonized food does not keep well, especially in warm weather. It should be prepared twice daily, and never be given when more than 12 hours old, or after having been reboiled. Peptonized food may be prepared by the gastric method, using pepsin and hydrochloric acid, or by the intestinal method, making use of the extract of pancreas. The latter is the preferable method. Probably the best solvent for an extract of pancreas is dilute spirit. The pancreas of the pig yields the best or most active preparation, but that of the ox or sheep may be employed. Calf pancreas yields an active extract, not, however, affecting starchy materials.

To make an extract of pancreas, first free the pancreas from fat, and cut into small pieces. Mix with 4 times its weight of dilute spirit, cork in a wide-mouthed bottle, and set aside for a week, agitating once daily, at the end of which time it is strained through muslin and then filtered through paper until clear.

Peptonized Milk.—Heat a pint of milk mixed with half a pint of water to about 140° F., or heat one-half of the milk and water to the boiling-point, and add to the other (cold) half 2 teaspoonfuls of the extract of pancreas and 10 grains of sodium bicarbonate. Pour into a covered jug and place in a warm situation. In an hour or hour and a half it is to be boiled for 2 or 3 minutes, and may then be used like ordinary milk.

Peptonized Gruel.—It may be prepared from wheaten flour, oatmeal, arrow-root, sago, pearl-barley, pea or lentil flour. The gruel should be well boiled, thick, and strong, and poured into a jug and allowed to become lukewarm. Pancreatic extract, a dessertspoonful to a pint of gruel, may then be added, and the jug kept warm for 2 hours or so, and then the gruel brought to a boil and strained. This gruel is not generally an acceptable food for invalids, but it serves as a basis for peptonized soups, jellies, and blanc-manges.

Peptonized Milk-gruel.—This may be regarded as a predigested bread and milk, and is especially useful for weak digestions. Thick gruel from farinaceous articles, while boiling hot is added to an equal quantity of cold milk. To each pint of this mixture 2 or 3 teaspoonfuls of extract of pancreas and 10 grains of sodium bicarbonate are added. It is then treated as peptonized milk or gruel. If too bitter, less pancreatic extract may be used.

Peptonized Soups, Jellies, and Blanc-manges.—One way of making soups is to add to peptonized milk or gruel what is known as "stock." A better way is to use thin and watery peptonized gruel instead of simple water for extracting the soluble matters of shins of beef and other materials used in preparing soups. Jellies may be made by simply adding the due quantity of gelatin or isinglass to hot peptonized gruel and flavoring to suit. Blanc-manges are made in the same way, using peptonized milk instead of gruel, and adding cream. If the final boiling in the preparation of the peptonized gruel or milk is not complete, the extract will act on the gelatin, and the power of setting on cooling will be lost.

Peptonized Beef-tea.—To a pint of water are added a pound of finely minced lean beef and 10 grains of sodium bicarbonate. Allow this combination to simmer for an hour and a half in a covered sauce-pan. Decant the ensuing beef-tea into a covered jug. Beat up with a spoon the undissolved beef residue into a paste, and add to the tea in the jug. When it is cool enough to be tolerated in the mouth, a tablespoonful of the extract of pancreas is to be added, and the whole stirred together and kept warm for 2 hours, being occasionally agitated, at the end of which time the contents of the jug are boiled for 2 or 3 minutes, and finally strained. Beef-tea prepared in this way contains about 4 percent organic residue, of which more than three-fourths consists of peptone. When seasoned with salt, its taste resembles ordinary beef-tea.

Peptonized Enema.—To the enema prepared in the usual way—with a mixture of milk and gruel, or of milk alone, or of gruel and beef-tea—is added, just before administration, a dessertspoonful of liquor pancreaticus, or extract of pancreas. The ferment, in the warm temperature of the bowel, acts favorably, and no acid secretion interferes with the completion of the digestive process. It is a valuable resource when the stomach is intolerant of food, or obstruction exists in higher portions of the digestive tract.

PEPTONURIA.—The presence of peptone in the urine. The proteid body found in the urine in peptonuria is really not a peptone but an albumose, and a better term would be albumosuria. Albumose is characterized by yielding the biuret reaction; it is not precipitated by heat, but is precipitated by ammonium sulphate. Peptonuria—*i. e.*, albumosuria—occurs in all conditions attended by the destruction of tissue, especially in suppurative processes, purulent pleurisy, purulent peritonitis, abscesses, cerebrospinal meningitis, pyelonephritis, bronchoblennorrhea, in some cases of pulmonary tuberculosis with cavity formation, and during the puerperal state. The blood in leukemia may also contain albumose. Propeptonuria is probably only an albumosuria of high degree. See URINE.

PERCENTAGE SOLUTIONS, TABLE OF.

Based on 456 Grains as the Weight of One Fluid Ounce of Water.

Dissolve the quantity of ingredient (in grains) in less water than the required volume of solution, and then add sufficient water to bring the solution up to the required volume.

SOLUTION		℥j.	℥ij.	℥iv.	℥vj.	PINT	QT.	GALLON.
1/100 p.c.,	1:10,000	1/25	1/10	1/5	3/10	3/4	1½	6
1/50 p.c.,	1:5,000	1/10	1/5	4/10	½	1½	3	12
1/30 p.c.,	1:3,000	1/6	3/10	6/10	9/10	2	5	19½
1/20 p.c.,	1:2,000	1/5	½	9/10	1⅓	3½	7¼	29
1/10 p.c.,	1:1,000	½	9/10	2	3	7¼	14½	58
1/8 p.c.,	1:800	6/10	1	2¼	3½	9	18	73
1/5 p.c.,	1:500	9/10	2	3½	5½	14½	29	117
¼ p.c.,	1:400	1	2¼	4½	7½	18	36	146
⅓ p.c.,	1:300	1½	3	6	9	24	49	195
½ p.c.,	1:200	2¼	4½	9	14	36	73	292
⅔ p.c.,	1:150	3	6	12	18	47	95	379
9/10 p.c.,	1:111	4	8	16	25	65	131	525
1 p.c.,	1:100	4½	9	18	27	73	146	584
2 p.c.,	1:50	9	18	36	55	146	292	1167
3 p.c.,	1:33⅓	14	27	55	82	219	438	1751
4 p.c.,	1:25	18	36	73	110	292	584	2335
5 p.c.,	1:20	23	46	91	137	365	730	2918
7 p.c.,	1:14.28	32	64	128	192	511	1021	4086
10 p.c.,	1:10	46	91	182	274	730	1459	5837
12 p.c.,	1:8⅓	55	109	219	328	876	1751	7004
15 p.c.,	1:6⅔	68	137	274	410	1094	2189	8755
20 p.c.,	1.5	91	182	365	547	1459	2918	11673
30 p.c.,	1:3⅓	137	274	547	821	2189	4378	17510
40 p.c.,	1:2½	182	365	730	1094	2918	5837	23345
50 p.c.,	1:2	228	456	912	1368	3648	7296	29184

(POTTER.)

PERCUSSION.—A method of physical examination applied by striking upon any part of the body, with a view of ascertaining the conditions of the underlying organs by the character of the sounds elicited. In percussing attention is paid to the resonance, the pitch, and the duration of the sound, and to the resistance of the parts. Percussion is sometimes performed by striking with the entire hand. The method, in the case of the chest, serves to distinguish marked degrees of dulness from resonance.

Auscultatory percussion is percussion combined with auscultation. The method by which fine shades of difference in the quality of sounds may be detected. It is employed for outlining organs, both those containing and those not containing air. It is best applied by placing a double stethoscope at a fixed point and percussing gently all around. The stethoscope may be held with one hand, while with a finger of the other immediate percussion is made; or an assistant may percuss. See CHEST (Examination).

PERICARDITIS.—See HEART-DISEASE (Organic.)

PERICARDIUM, INJURIES.—See HEART (Injuries).

PERIHEPATITIS.—See LIVER.

PERIMETER.—See FIELD OF VISION.

PERINEUM, INJURIES.—Injuries to the perineum are almost invariably the result of childbirth. They are classified, according to the extent and position of the injury, into: (1) Slight median tear not involving the anal sphincter; (2) median tear in which the sphincter is divided; (3) laceration in one or both vaginal sulci; and (4) subcutaneous laceration of the muscles and fascia.

These injuries should be repaired by **perineorrhaphy.** Primary perineorrhaphy, or repair of the injury within the first few hours **after labor**, is preferable. When this cannot be done, or when it has been neglected, secondary perineorrhaphy should be performed. This may be done any time after cicatrization has occurred.

Slight Median Tear not Involving the Sphincter.—This tear passes through the fourchet, and may extend down the median line of the perineum as far as the sphincter. It usually extends for 1/2 of an inch or more up the posterior vaginal wall. In this injury there is no involvement of the supporting structures of the pelvic floor, and, therefore, there is no tendency toward prolapse of the vaginal walls and pelvic organs. This tear should be closed immediately after labor by the introduction of sutures, as shown in the accompanying illustration. The first stitch should be introduced at the apex of the tear in the posterior vaginal wall. It should be carried well out, so as to include sufficient tissue, and should emerge at the bottom of the tear; it should be reintroduced here, to be brought out on the opposite side of the tear at a point corresponding with its first point of introduction. Sufficient stitches should be introduced, about 1/4 inch apart, to completely close the wound. The external tear should be closed in a similar manner. The sutures may be tied or shotted. If this tear is neglected at the time of its occurrence, the secondary operation of perineorrhaphy is not indicated.

Median Tear in Which the Anal Sphincter is Divided.—This tear, although an extensive one, does not injure the supporting structures of the pelvic floor. There is, therefore, no tendency toward prolapse of the pelvic organs or the vaginal walls. The laceration takes place in the median line of the perineum, extends through the sphincter muscle, and may involve the rectovaginal septum to a greater or less extent. Permanent incontinence of feces is the result of this injury.

It is of the utmost importance that an injury of this character be repaired immediately after labor. The stitches are introduced as follows: The tear in the rectovaginal septum should first be closed by interrupted sutures, placed about 1/4 inch apart. They should be introduced from the vaginal aspect, beginning at the apex of the tear, and should extend to, but not through, the rectal mucous membrane. These sutures should now be shotted. The sutures which bring together the divided ends of the sphincter ani muscle are next introduced. This is obviously the most important step of the operation, since failure to bring together the ends of this muscle will result in continued incontinence of feces. The ends of the divided muscle are usually clearly marked by a dimple well back of and to each side of the anal opening. The first suture is introduced from the skin surface, back of and to the inner side of this dimple, close to the rectal mucous membrane. It is passed upward and outward through the dimple, and finally inward, to emerge at the apex of the tear in the rectovaginal septum, or if the septum has been extensively torn and repaired, just below the last stitch in the septum. It is reintroduced here, and is passed outward, downward, and inward through the septum, to emerge on the skin of the perineum just below the dimple of the opposite side. For greater security, a second similar stitch is introduced a little to the outer side of the first one. The subsequent steps of the operation consist in closure of the external perineal tear by a row of interrupted stitches. These stitches are now shotted, the two sutures holding the sphincter ani being secured first. If this injury is neglected at the time of its occurrence secondary perineorrhaphy must be performed. The technic of this operation is similar to that just described, except that the torn surface will have to be denuded. This is done with sharp scissors, particular care being taken to expose the ends of the divided sphincter muscle.

Laceration in One or Both Vaginal Sulci.—This tear extends in the direction of the ischiorectal fossa, and divides the vaginal sphincter, the transverse perineal muscle, and the inner fibers of the levator ani. The anal sphincter usually escapes, since it is out of the line of injury, which is usually bilateral, the left sulcus being, as a rule, the more extensively torn.

The result of this injury is prolapse of the vaginal walls and pelvic organs, since the supporting structures of the pelvic floor are lacerated. Repair should be immediately undertaken by first closing the torn sulci, and finally the tear of the external perineum in the manner that is described under the secondary operation.

The best secondary operation for the repair of a tear involving the sulci is *Emmet's*, which is performed as follows: The crest of the rectocele is seized with a tenaculum; the labia majora are seized with tenacula at about the height of the orifice of the ducts of the vulvovaginal glands. If the rectocele is drawn to one side, a triangular area is exposed which represents the site of the old laceration. This area is next denuded. The rectocele is now drawn to the opposite side, when a similar area is exposed and denuded. The base of the rectocele and a small portion of the skin of the perineum are next denuded. In denuding these areas care should be taken to remove every particle of scar tissue and mucous membrane.

The stitches are next introduced, the sulci being closed first. The first stitch passes directly across the apex of the tear in the left sulcus. The second stitch is introduced about 1/4 inch lower down, and about 1/8 inch from the edge of the mucous membrane on the left vaginal wall; it passes outward, downward, and inward, emerging at the bottom of the sulcus. It is reintroduced here, and emerges on the edge of the mucous membrane of the rectocele at a point corresponding to its point of insertion. A third, and sometimes a fourth, suture is introduced in a like manner. Similar stitches are introduced in the right sulcus.

The skin of the perineum is now closed by a suture which is known as the crown stitch. It is introduced on the skin, passes outside of the denuded area, and emerges at the edge of the mucous membrane of the left lateral vaginal wall just below the last suture in the sulcus. It is then passed through the rectocele below the mucous membrane, and finally through the lateral denudation of the opposite side. A second suture, somewhat like the crown stitch, is usually necessary. The sutures in the sulci are first shotted, and finally those which close the skin of the perineum.

Subcutaneous Laceration of the Muscles and Fascia.—In this tear the muscles and fascia are injured, while the mucous membrane and skin remain intact. This is due to the great elasticity of the latter, which enables them to stretch, while the deeper structures, which are less elastic, tear. This injury invariably occurs in the sulci, and its results and treatment are the same as the preceding tear. It is sometimes called relaxation of the perineum. The best suture material for the foregoing operation is silkworm-gut. After the operation is completed, a douche of sterile water is given and a light vaginal tampon of iodoform gauze is introduced. This tampon is removed at the end of 24 hours. The bowels are moved on the third day. The stitches are removed at the end of 2 weeks, after which the patient may get out of bed. She should avoid heavy lifting, long standing, or any other form of active or tiresome exercise for at least 2 months after the operation.

PERIOSTITIS.—See BONE (Diseases).

PERISPLENITIS.—See SPLEEN (Diseases).

PERITOMY.—See PANNUS, TRACHOMA.

PERITONITIS.—Inflammation of the peritoneum. According to cause it may be primary or secondary; according to extent, local or general; according to time, acute or chronic; and according to the exudate, serofibrinous, fibrinous, or purulent.

Etiology.—(1) Traumatic; (2) secondary to a suppurative process elsewhere, as abscess, pyosalpinx, endometritis, appendicitis; (3) secondary to obstruction of the bowels with infection; (4) secondary to certain diseases, as typhoid fever, hepatic abscess, empyema of the gall-bladder, tuberculosis, nephritis, or rheumatism. (See COLON BACILLUS INFECTION.) Idiopathic peritonitis is no longer recognized. Traumatic peritonitis, following chemical irritation as well as injury, gives rise to distinctly localized trouble and is very different from true acute peritonitis, which is always caused by bacterial infection. In the former condition the elevation of temperature is probably caused by the absorption of fibrin ferment or other chemical substance generated in the injured tissues.

Acute Peritonitis.

Pathology.—The membrane is red, swollen, and covered with an exudate—serofibrinous, fibrinous, or purulent. Frequently the coils of intestines are glued together through the medium of the inflammatory creamy exudation, which in many cases undergoes organization with the formation of fibrous bands. The endothelium undergoes desquamation or is infiltrated with liquid, and if infection takes place, fatty degeneration ensues, with the formation of pus. The usual infective microorganisms are the bacillus coli communis and the streptococcus.

Symptoms and Clinical Course.—Diffuse pain over the entire abdominal region and abdominal distention are the two most characteristic symptoms. On pressure over this area the patient complains of excessive tenderness, and, as in appendicitis, the dorsal decubitus is assumed to relieve as much as possible the tension of the abdominal muscles. Vomiting is an early symptom: first the contents of the stomach are ejected, and later the vomitus has a greenish tint, showing the presence of bile. The bowels are obstinately constipated; the temperature is considerably elevated (103° to 104° F); the pulse is rapid (120 to 140), small, hard, and of a wiry character; the respirations are increased in number (30 to 40), and deep breathing is painful on account of distention of abdomen; the skin is moist and cold, devoid of color; the eyes are sunken; the cheek bones are prominent; the nose is pinched, giving rise to the Hippocratic facies. When the case terminates favorably, the fluid may be collected in sacs formed by the adhesion of the peritoneum to that of the intestine, and small areas of dulness may be found. The duration of an acute attack of peritonitis is from 6 to 9 days.

Diagnosis.—See table under INTESTINAL OBSTRUCTION.

Prognosis is always grave, but modern methods of treatment have lowered the mortality rate. The pulse is the best index of the gravity of the infection.

Treatment.—Medical treatment offers little hope in this affection. The cases which terminate favorably under its employment would probably do equally as well if no drugs were used. The key-note of success is early determination and removal by surgical means of the causative lesion. Opium should never be given until a diagnosis has been made, as it obscures the symptoms and also confers a false sense of security upon the patient, who naturally thinks that the relief of pain which follows its administration is a sign that his condition is improving. In cases in which operation is refused and in those in which the surgeon is called when it is too late to operate, then of course its use is permissible. Saline cathartics, at one time highly esteemed by some practitioners in the early stage of the disease, are not only devoid of curative effect but undoubtedly are harmful in that they may cause dissemination of an infection which nature is endeavoring to localize. A movement of the bowels may be obtained by a simple or medicated enema. Neither food nor drink should be given by the mouth, but enough fluid given by rectum to relieve thirst. As diagnosis is usually not difficult in the early cases an exploration can be made with no little degree of assurance that the causative lesion will be found and removed. The later cases constitute one of the most difficult problems of surgery. As a general rule it may be stated that the decision to operate or not to operate will depend upon the degree of collapse from which the patient is suffering. Each case of this kind must be decided upon its own merits as there is no invariable rule which will apply to all. In operations in these cases all delaying minutiæ of technic should be disregarded. The abdomen is opened, the cause of the peritonitis removed, if possible, and drainage made through the original wound and also through a suprapubic incision. The postoperative treatment is very important. John B. Murphy has taught the profession the value of introducing large quantities of water or salt solution into the rectum by means of a constant though gentle flow. The patient is placed in the high-head (Fowler's) position and a nozzle, perforated in three or four places and attached to a container by a rubber tubing, is inserted into the anus. The container is placed but a few inches above the level of the rectum, so that the fluid shall flow in very slowly, no faster than it is absorbed. The flow may be regulated by compressing the tube, so that no fluid shall accumulate in the bowel. From a pint to a quart will ordinarily be absorbed in an hour. (See PROCTOCLYSIS.) In addition to the institution of this measure, food by the mouth is withheld, in order to prevent peristalsis. Concentrated liquids may be given by rectum either separately or mixed with the fluid used for proctoclysis. Strychnin and morphin given hypodermatically may be used according to the indications of the individual case.

Chronic Peritonitis.

A form of peritonitis of slow development, and generally secondary to some constitutional disease. It occurs in two forms, circumscribed adhesive or diffuse proliferative.

Etiology.—(1) Most frequently tuberculosis; (2) cancer; (3) nephritis; (4) chronic alcoholism, are the most common etiologic factors.

Pathology.—The coils of intestines are often firmly matted together, and bands of adhesions connect the intestine to the peritoneum, often forming pouches in which fluid may be present. Its color in tuberculosis and in malignant diseases is usually reddened from the presence of blood.

Symptoms and Clinical Course.—The symptoms at first are very indefinite, though a sense of tenderness may be complained of on pressure over the affected area. The abdomen becomes retracted and hardened, a stiff, rigid abdomen being quite characteristic of tubercular peritonitis. Later tympany is present especially in the upper part of the abdomen. Ascites may be present. Localized swellings may occur, giving rise to pain and edema on pressure. The temperature is usually normal, or only slightly elevated. Constipation and albuminuria are common.

Prognosis is unfavorable.

Treatment is palliative by opium and other appropriate remedies. Treatment for tuberculosis (*q. v.*) should be instituted in the tubercular form. When ascites is present, or there is a purulent condition, the surgeon should perform a celiotomy. An incision is made in the median line evacuating the serum or pus, and, by a lifting motion of the abdominal wall, causes a free access of air within the peritoneal cavity. Abscesses found may be iodoformized after evacuation and drying. The abdomen should be closed without drainage. Secondary infection and fecal fistula are apt to result from the use of a drain. Results have been most encouraging, although surgeons do not agree as to the way in which the cure is produced. Dense adhesion of the intestines to the abdominal wall takes place in the course of a cure.

PERITYPHLITIS.—Inflammation of the peritoneum surrounding the cecum. This is a disease most frequently encountered in the young and in males. It is usually due to some inflammatory disease of the vermiform appendix, and is marked by pain in the right iliac fossa, and a tumor—elongated, sausage-shaped, dull on percussion, and very tender—in the same region. The disease may give rise to general peritonitis from escape of pus into the general peritoneal cavity. The abscess may burst through the abdominal wall into the bowels, bladder, or pleural cavity. See APPENDICITIS.

PERMANGANATE, POTASSIUM.—See MANGANESE.

PERNICIOUS ANEMIA.—See ANEMIA (Pernicious).

PERNIO.—See FROST-BITE.

PERSPIRATION.—See DIAPHORETICS, SWEAT-GLANDS.

PERTUSSIS.—See WHOOPING-COUGH.

PESSARY.—See UTERUS (Retrodisplacements).

PETECHIA.—A small, round, oval, or irregular spot of ecchymosis beneath the epidermis, varying in size from a flea-bite to an area having a diameter of 1/2 inch or more. It is not raised above the level of the skin, but is of a reddish or purple shade, and does not alter by pressure of the finger. Flea-bites have in them a puncture which is always perceptible, and which contrasts strongly with the lighter color of the rest of the disc. The tint varies according to age and the amount of effused blood. They occur on mucous membranes as well as on the skin, in purpura, scorbutus, malignant fevers, and in constitutional diseases. The term *petechial* is applied to certain varieties of diseases, such as typhus, when petechiæ occur in their course, or the eruption becomes hemorrhagic.

PETROLATUM.—A mixture of hydrocarbons, chiefly of the methane series, obtained from petroleum. It is colorless or yellowish, and in the latter case is more or less fluorescent; amorphous, odorless and tasteless, of neutral reaction, insoluble in water, slightly soluble in absolute alcohol, readily soluble in ether, chloroform, petroleum benzin, benzene, carbon disulphid, oil of turpentine, and fixed or volatile oils. The soft variety is known commercially as *terralin, cosmolin, vaselin, petroleum ointment,* etc. Besides petrolatum itself it is official in the following-named forms—**P. Album,** a white, unctuous mass, without odor or taste, of about the consistence of an ointment. **P. Liquidum,** a colorless, oily, transparent liquid, without odor or taste, but giving off, when heated, a faint odor of petroleum. **Paraffinum,** a mixture of solid hydrocarbons, a colorless, translucent mass, odorless and tasteless, and slightly greasy to the touch.

Petrolatum is a valuable protective dressing, and an excellent basis for ointments, having no acridity and no liability to become rancid. It is readily miscible with many active agents, as the alkaloids and phenol compounds, but it does not penetrate the skin so readily as animal fats and fixed oils. Uncombined, it forms an excellent bland application in all irritated conditions and injuries of the skin, and it has been used with benefit alone, or mixed with castor or olive oil, in chronic eczema accompanied by desquamation. Paraffin is employed by subcutaneous injection for cosmetic effects on saddle-shaped noses and other superficial deformities.

PHAGEDENA.—See ULCER.

PHARYNGITIS (Simple Angina).—An inflammation of the mucous membrane of the pharynx, and also very frequently involving the soft palate, uvula, tonsils, and larynx.

Varieties.—(1) Acute pharyngitis; (2) chronic pharyngitis.

Acute Pharyngitis.

Definition.—An acute catarrhal inflammation of the mucous membrane of the pharynx.

Etiology.—(1) Exposure to the cold and wet; (2) overheated sitting or sleeping room, with a sudden chilling; (3) sedentary habit, with indigestion and constipation; (4) certain diseases, such as tuberculosis, gout, rheumatism, and lithemia; (5) inhalation of steam, dust, or noxious vapors.

Symptoms.—There is pain on swallowing, accompanied by a sensation of dryness or of a foreign body, and a desire to clear the throat.

Tenderness may exist in muscles in region of neck and pain may arise from pressure over the region of the tonsils; for this reason in many cases the mouth cannot well be opened. Should the catarrhal process extend upward, the orifices of the eustachian tubes may become occluded, giving rise to temporary deafness or ringing in the ears; and if it extends downward into the larynx, hoarseness will be added to the other symptoms. Often the senses of taste and smell are temporarily impared.

Physical Signs.—On inspecting the pharynx it will be seen to be greatly reddened in color and the blood-vessels in a condition of hyperemia, especially on the posterior wall, and the uvula and fauces may be edematous. See PHARYNX (Examination).

Prognosis is favorable.

Treatment.—Rest in bed is essential; free purgation at the onset is desirable. Calomel (1/6 grain) should be given every hour until 6 or 8 doses have been taken, followed by a saline purge. A hot mustard foot-bath at bedtime is recommended. A commendable prescription is:

℞. Tincture of aconite,	♏ xlv
Solution of potassium citrate,	℥ ij
Aromatic elixir,	ʒ iv
Camphor water, add enough to make,	℥ iv.

One tablespoonful every 3 hours.

If there is much edema:

℞. Tincture of opium,	ʒ j
Tincture of belladonna,	♏ xv
Camphor water, add enough to make	℥ iv.

One tablespoonful every 3 or 4 hours.

Also apply locally boroglycerid (50 percent) or glycerol of tannin to the affected parts if they are edematous. Quinin (4 grains) every 3 or 4 hours may be administered. If the disease is due to a rheumatic tendency, sodium salicylate (7 grains) or aspirin is indicated.

Local Treatment.—Give small pieces of ice on the tongue every hour or two; apply at onset of symptoms a few drops of a solution of cocain (4 percent), and also:

℞. Menthol,	gr. vj
Almond oil,	ʒ ij.

Apply every 3 hours.

In some cases it is advisable to apply a strong solution of silver nitrate (20 grains to 1 ounce) during the initial symptoms. If the fever is high, phenacetin (5 grains) may be given every 3 or 4 hours and the aconite discontinued. A nutritious fluid diet should be given.

Chronic Pharyngitis.

Synonyms.—Clergyman's sore throat; chronic follicular tonsillitis.

Varieties.—(1) Hypertrophic; (2) atrophic; (3) ulcerative; (4) suppurative (hospital sore throat).

Etiology.—(1) Sequel of acute pharyngitis; (2) excessive straining of the voice or continuous clearing of the throat; (3) constant inhalation of dust or tobacco.

Symptoms and Clinical Course.—The voice is hoarse, often quickly fatigued, and may be entirely lost; cough is frequent and hacking in character; slight pain is complained of on deglutition. There is often a sensation of a foreign body lodged in throat, with a constant desire to expel it by forced effort, and, in some cases, the viscid, tenacious mucus may be tinged with blood.

Hypertrophic Pharyngitis.—The mucous membrane is swollen, hypertrophic, and covered with small reddish or pink granulations composed of glandular tissue. The capillaries are highly injected, and the surface of the mucous membrane seems rough and often mottled. The mucous secretion is thick, viscid, and very tenacious. Digestion is bad, and dyspepsia is a frequent accompaniment.

Atrophic Pharyngitis.—The mucous membrane is lighter in color and atrophied.

Ulcerative pharyngitis is characterized by the formation of ulcers, generally of a specific nature, such as from syphilis, tuberculosis, or cancer.

Syphilitic ulcers of the pharynx and tubercular ulcers of the pharynx are differentiated by Bosworth as follows:

SYPHILITIC ULCERS.	TUBERCULOUS ULCERS.
Deeply excavated.	No apparent excavation.
Few granulations, and those highly inflammatory.	Much indolent granulation.
Deep-red areola.	Faint areola.
Sharply-cut edges.	Irregular and ill-defined edges.
Distinct demarcation.	Demarcation indistinct.
Yellow purulent secretion.	Grayish, ropy mucous secretion.
Discharge profuse.	Discharge scanty.
Penetrating to deeper tissues.	Superficial, with lateral in place of deep extension.
No fever as a rule.	Hectic fever as a rule.

Suppurative Pharyngitis.—There is a suppurative inflammatory process, first confined to the pharynx, but later extending downward to the larynx and trachea, or upward into the nasal chamber. The predominant feature is its tendency to involve the deeper structures, leading to suppuration and sloughing.

Prognosis depends upon the cause. In the atrophic form the disease may be very obstinate. In the suppurative variety grave complications may ensue.

Treatment. Hypertrophic Pharyngitis.—Correct any constipation by the use of Rochelle or Epsom salts (2 to 3 drams), taken before breakfast, or fluidextract of cascara (1/2 dram) at bedtime. A pill composed of aloin, strychnin, and belladonna may be taken 3 times daily. For the indigestion, avoid overloading the stomach, especially with rich desserts. Alcohol should not be used. Tobacco, tea, and coffee should be restricted. Give elixir of lactopeptin and gentian (2 drams) after each meal. As a general tonic, the elixir of the phosphates of iron, quinin, and strychnin, after meals, is valuable. In bathing it is necessary to guard against taking cold, and the time should be so arranged as to exercise this precaution. Frequent bathing is essential. To render the throat less susceptible, cold water may be sponged over parts once or twice daily. The habit of constantly clearing the throat should be absolutely repressed.

Local Treatment.—Alkaline sprays should be used every 2 or 3 days to keep the parts clean.

For this purpose, an alkaline antiseptic tablet (Seiler), dissolved in 3 ounces of water, acts admirably.

Subsequent to the spraying of the throat by the alkaline solution, the following local application may be made by means of a spray:

℞. Menthol, gr. ij
Eucalyptol, gr. j
Liquid vaselin, ℥ j.

The anterior and posterior nares may also be cleansed in the same manner, and the local application made.

Spray for anterior nares to be used cautiously:

℞. Menthol, gr. j
Compound tincture of benzoin ℥ j.
Apply the smallest amount possible to parts by means of an atomizer, once a week.

Should the granulations not begin to disappear within the first 2 or 3 weeks of treatment, they may be touched with the galvanocautery and the other local applications be discontinued for a few days. Before applying the cautery to parts, the latter should first be cleansed with the alkaline spray and subsequently swabbed with a solution of cocain (4 percent), being careful that none of the solution is swallowed, as alarming symptoms have sometimes occurred from this accident. In case the galvanocautery is not used, an application of silver nitrate (20 grains to 1 ounce) may be made once a week, or boroglycerid (50 percent) or glycerol of tannin used every 3 days. Carbolic acid should be used cautiously about the nares, as it has been known to produce anosmia.

Atrophic pharyngitis may result from the hypertrophic form, and should be treated in much the same way. The crusts should be cleansed and an oily solution used to keep the nares moist.

Ulcerative pharyngitis should be treated specifically. Locally, iodoform in powder may be blown over the parts; equal parts of iodoform and boric acid may also be used. At certain intervals the granulations may be cauterized with molded silver nitrate or the same salt in strong solution.

Suppurative pharyngitis calls for surgical interference if abscesses develop. When this complication does not ensue, prescribe, as a gargle, the alkaline solution recommended for the hypertrophic form. Apply cold cloths to throat externally, and give large doses of the tincture of ferric chlorid containing quinin.

PHARYNX, EXAMINATION. Anatomy.—The pharynx is that portion of the alimentary canal posterior to the nose, mouth, and larynx. It is a membranous sac about 4 1/2 inches in length, of cone shape, with the apex directed downward. The pharynx has 7 openings: Two posterior nares, 2 eustachian tubes, mouth, larynx, and esophagus. On each side of the pharynx and between the anterior and posterior palatine folds may be seen the tonsils.

Normal Appearance.—In color it is somewhat redder than the mucous membrane of the mouth. On the posterior surface may be seen minute elevations or follicles. The minute arterial and venous blood-vessels are very tortuous and distinct, but are occasionally obscured by an excess of saliva and mucus.

Examination of the pharynx may be made with either direct or reflected light. In the former instance the patient should sit facing the strongest light possible, and the examination conducted either by holding the tongue down with a tongue-depressor, or else have the organ grasped between the folds of a napkin and drawn forward. If the light is insufficient, the room may be darkened, and the light from a lamp reflected by means of the head-mirror. The posterior nares may also be examined at the same time by the use of the laryngoscopic mirror. In those cases in which there is a hypersensitiveness of the pharynx, and in which it is necessary to examine the posterior nares, a very small amount of a 4 percent solution of cocain may be swabbed over the vault of the pharynx. The laryngoscopic mirror should be gently heated before being introduced, otherwise the moisture from breathing will obscure the image.

PHARYNX, INJURIES.—See Neck (Injuries).

PHENACETIN.—A phenol derivative (acetparaphenetidin), the product of the acetylization of paraamidophenetol. It occurs in white, glistening, crystalline scales, or fine, crystalline powder, orderless and tasteless, soluble in 70 parts of boiling water, in 12 of alcohol, nearly insoluble in water. Dose, 5 to 10 grains in powder, tablets or cachets, hourly or every two hours, but larger doses, have been administered.

The action of phenacetin is similar to that of acetanilid. It is one of the safest of the new synthetic antipyretics, yet in sufficiently large doses it is as poisonous as any of its analogues. In one case 22 1/2 grains, taken by a woman within six hours, produced collapse with marked lividity, great dyspnea and restlessness, cold perspiration, and slightly dilated pupils; in another case 120 grains were taken in twelve hours without the production of any symptoms (Wood). A toxic dose causes vomiting, cyanosis, chocolate-colored urine, yellow discoloration of the body, leukocytosis, and death by respiratory paralysis. In medicinal doses it depresses the heart slightly, and does not affect the blood or the respiration. It acts more gradually than other antipyretics, its maximum effect being reached in three or four hours. It reduces fever by lessening heat production and causes perspiration without producing collapse. It is also analgesic and hypnotic, relieving pain and inducing sleep. It has been administered with benefit, in 2-grain doses with 1/2 grain of citrated caffeine at short intervals, for migraine; also in epidemic influenza, both as a prophylactic and as a remedy. As an antipyretic it is extensively employed in phthisis, peritonitis, polyarthritis, endocarditis, typhus and typhoid fevers; and as an analgesic in vasomotor neuroses, for the lancinating pains of locomotor ataxia, also in neuralgia and hemicrania. It is highly praised in whooping-cough, rheumatic and other fevers, and though slower in action than antipyrin or acetanilid, it is deemed fully as efficient in reducing pyrexia, while usually free from the depressant after-effects of the latter agents. It is strongly commended as a local antiseptic dressing.

For neuralgia:

℞. Phenacetin,	gr. x
Citrated caffein	gr. v
Sugar of milk,	gr. xx.

Divide into 10 powders. Give 1 powder every 2 hours while the pain exists.

Incompatibles are: Acids (strong), alkalies (strong), chloral hydrate, oxidizers, piperazin, phenol, pyrocatechin, salicylic acid.

PHENOCOLL.—Produced by the interactions of phenetidin and glycocoll. **P. Hydrochlorid** is a soluble phenacetin, chemically and medicinally, and is distinguished by its comparatively free solubility. It is a white, fine powder, incompatible with alkalies, and is given in doses of 5 to 20 grains 4 times a day. It is best administered in capsule. It has decided antipyretic, antirheumatic, and analgesic powers, is promptly absorbed and readily excreted, and reduces fever without the marked sweating or other unpleasant after-effects of other coal-tar antipyretics. In hectic, malarial, typhoid, and other fevers, in acute rheumatism, neuralgia, epidemic influenza and its neuralgic pains, in gouty and rheumatic affections when accompanied by fever and pain, and in combination with piperazin (15 grains), it has been employed with success. **P. Salicylate,** the salicylate of the synthetic base phenocoll, combines the actions and uses of its constituents. Dose, 15 to 30 grains.

PHENOL. C_6H_5OH.—Formerly called carbolic acid—is procured from coal-tar by fractional distillation and subsequent purification, or made synthetically. It has a very peculiar and characteristic odor, a burning taste, is poisonous and has preservative properties. It crystallizes in colorless rhombic needles; and at ordinary temperatures it dissolves in water with difficulty (1:15), but is soluble in alcohol, ether, glacial acetic acid, and glycerin in all proportions. Upon exposure to light and air it deliquesces, and acquires a pinkish color. It is used in the manufacture of many of the artificial coloring-matters: *e.g.*, picric acid, used as a yellow dye. Large quantities of various qualities of carbolic acid are consumed for antiseptic purposes. Dose, 1/4 to 1 grain, well diluted.

Therapeutics.—Phenol is employed as an antiseptic, caustic, and local anesthetic. For antiseptic dressings and for purifying sponges, and for instruments, it is most useful. In diphtheria, infectious stomatitis, or ulcerative sore throat, combined with glycerin, it is a valuable application. Internally it is used in acute diarrhea and flatulent dyspepsia (1/4 to 1 grain), and as a deodorant inhalant in bronchiectasis, pulmonary gangrene, and phthisis. Injections of 3 to 5 minims of a 2 percent solution will often abort carbuncles and boils. It is in common use in dentistry as an antiseptic and local anesthetic. It will allay the itching in eczema, pruritus, and piles, and will check obstinate vomiting from gastric irritability. Mixed with vaselin, 5 drops to the ounce, it makes a soothing application for burns. As a caustic it may be used against condylomata and chancroids.

A wash in acne or impetigo:

℞. Phenol,		gr. x
Glycerin,	} each,	℥ j.
Rose-water,		

In tympanites:

℞. Phenol,	gr. j
Extract of opium,	gr. j
Bismuth subnitrate,	gr. xviij.

Make into 6 powders. One powder 3 times a day.

For mosquito-bites:

℞. Phenol,	gr. xxx
Glycerin,	ʒ iij
Rose-water, enough for	℥ viij.

Make into a lotion.

Poisoning.—A toxic dose of carbolic acid, taken internally, is one of the most rapidly acting poisons known, sometimes equaling prussic acid in this respect. The symptoms develop almost immediately, and death may occur in a very few minutes; but usually the patient lives from 1 to 10 hours; rarely over 2 days. In some cases a great amendment has occurred, with restoration of consciousness, but after some hours sudden and fatal collapse has supervened. The minimum fatal dose is not determined, but 1/2 of an ounce has frequently caused death; and doses as small as 6 minims have given rise to dangerous symptoms. Cases of suicidal and accidental poisoning by this drug are very frequent, by reason of the facility with which it may be obtained for use as a disinfectant.

If the patient is seen shortly after ingestion, apomorphin may be administered hypodermically, as a rapidly acting emetic; but in any case the stomach should be washed out freely with alcohol and water, equal parts of each, and 8 or 10 ounces of the same should be left in the stomach for a short time, and this is to be followed by a washing out with warm water. Next in value is any soluble sulphate to form the harmless phenolsulphonates: as, magnesium sulphate 1 ounce or sodium sulphate 1/2 of an ounce, dissolved in 1/2 of a pint of water. Even if several hours have elapsed since the ingestion of the poison, the sulphates should be used, as their antidotal action proceeds in the blood. In one case where 1/2 of an ounce of the 95 percent acid had been taken, nearly 3 ounces of magnesium sulphate (Epsom salts) were used, resulting in complete recovery from an apparently hopeless condition. Stimulants, as ether or brandy hypodermically, should be used freely; also hot-water bottles and hot blankets if signs of collapse appear. Vegetable demulcents may be given (but no oils or glycerin), to protect the mucous surfaces. Liquor calcis saccharatus or syrupus calcis is also antidotal to the poison in the stomach, but is much less efficient than the sulphates. Atropin hypodermically is a very complete physiologic antagonist to the systemic symptoms, maintaining the heart and respiration until elimination occurs (Post). Oils should not be used, as they increase the absorption of the poison (Potter).

Incompatibles are: acetanilid, acetphenetidin (phenacetin), antipyrin, albumin, antisepsin, borneol, bromal hydrate, bromin water, butylchloral hydrate, camphor, chloralformamid, chloral hydrate, collodion, diuretin, ethyl carbamate (urethan), euphorin, exalgin, ferric salts, gelatin in dilute solution, hydrogen dioxid, lead acetate, menthol, methacetin, naphthol, nitric acid, phenyl salicylate (salol), piperazin, potassium permanganate, pyrocatechin, pyrogallol, resorcinol, sodium phosphate, thymol, terpin hydrate.

Preparations.—P. Liquefactum, a liquid composed of not less than 86.4 percent by weight of absolute phenol, and about 13.6 percent of water. Dose, 1/2 to 2 minims. **Glyceritum P.,** has of liquefied phenol 20, glycerin 80. Dose, 3 to 10 minims. **Unguentum P.,** has of phenol 3, white petrolatum 97. For external use. **Sodii Phenolsulphonas** (*Sodium sulphocarbolate*), occurs in transparent, rhombic prisms, soluble in 5 of water. Dose, 2 to 10 grains. **Zinci Phenolsulphonas** occurs in transparent, rhombic prisms, soluble in 2 of water. Dose, 1 to 5 grains.

PHENOLPHTHALEIN.—A white powder made by the interaction of phenol and phthalic anhydrid. It is used as a laxative and purgative. Dose, 1 to 3 grains. See CONSTIPATION.

PHENOLSULPHONATE.—A salt of phenolsulphonic acid.

Zinc phenolsulphonate is antiseptic and disinfectant. It is used as an intestinal antiseptic and sometimes in small doses for fetor of the breath.

The phenolsulphonates of sodium and potassium are employed internally with advantage in septic diseases, the exanthems, diphtheria, puerperal fever, etc., with the object of obtaining the antiseptic action of phenol without the dangers attending its use in efficient doses. They may be used locally with good results in aphthæ, tonsillitis, otorrhea, gonorrhea, and for inflamed mucous membranes generally.

PHENOSALYL.—A clear, syrupy liquid, prepared by fusing together phenol 9 parts, salicylic acid 1, lactic acid 2, and menthol 0.1. It has a pleasant odor, is very soluble in water, and is used in a 1 percent solution as an antiseptic application, and in 10 to 30 percent solutions as a curative lotion for varicose ulcers and ulcerated gummata. It is said to be superior as a germicide to any one of its ingredients, and to prove much less toxic than the agents usually so employed.

PHIMOSIS.—See PENIS (Diseases).

PHLEBITIS.—See VEINS (Inflammation).

PHLEBOTOMY.—See VENESECTION.

PHLEGMASIA ALBA DOLENS (Milk Leg).—An acute swelling of the leg due to venous obstruction from thromboses, and occurring most frequently in women after labor.

Etiology.—It is usually due to some form of septic infection of the genital region. Perineal or cervical tears may be the point of entrance of the poison. Infection of the blood-vessels at the placental site is probably the most frequent cause. Occasionally it may be due to simple pressure; these cases arise usually during the latter part of pregnancy.

Symptoms.—The symptoms usually develop from 1 to 3 weeks after labor. The leg becomes swollen, firm, and tender on pressure. The skin is strongly stretched and white in color; movement of the leg is extremely painful. There may be tenderness and redness over the course of the femoral vein. One or both legs may be affected. Fever, rapid pulse, and prostration, more or less marked, are common accompaniments. In the severer cases suppuration and abscess of the cellular tissue of the leg may develop.

Prognosis.—The prognosis depends very largely upon the cause of the condition. If it is an accompaniment of a general septic process, it is very grave. It is always doubtful, on account of the liability to embolism.

Treatment.—This consists in elevation of the leg with absolute rest. It should be well protected with cotton, and, if the pain is very severe, hot applications or ichthyol ointment may be tried. Should abscess occur, free incision and drainage are required. The constitutional treatment should consist in plenty of good, nutritious food and free stimulation.

PHLYCTENULAR CONJUNCTIVITIS.—See CONJUNCTIVITIS.

PHONENDOSCOPE.—An instrument designed to be used in place of the stethoscope in auscultation. It consists of a shallow metal cup covered by a disc of ebonite, with a perforation in the cup to which are attached rubber tubes for the ears. From the center of the disc of ebonite arises a little rod with a button at the end. The tubes are placed in the ears, and the button is placed over the organ to be examined, while the finger is drawn over the skin, beginning at the point where the button is applied and running outward. The rasping bruit heard before the application of the phonendoscope ceases as soon as the finger passes beyond the organ. The instrument is useful to differentiate murmurs and distinguish between endocardial and pericardial sounds. It is a distinct improvement over the binaural stethoscope. See CHEST (Examination).

PHOSPHORIC ACID. H_3PO_4.—Orthophosphoric acid. It is said to be of value in strumous affections, but is of little real benefit except as a feeble digestive stimulant. **Dilute phosphoric acid** contains 10 percent of the absolute acid. Dose, 5 to 45 minims.

PHOSPHORUS.—A nonmetallic element, having a quantivalence of III or V, and an atomic weight of 31. Symbol, P. Phosphorus does not occur in the free state, but is widely distributed in rocks, in fertile soils, in animal and vegetable tissues, in urine, and in guano. The human body contains a large quantity of calcium phosphate in the form of complex organic compounds. Phosphorus is an important constituent of nervous tissue. In commerce it is prepared from bone-ash, or from sombrerite, an impure calcium phosphate found in West Indian guano. Phosphorus may be obtained in several allotropic forms. **Ordinary phosphorus** is a yellowish-white, waxy solid, of a specific gravity of 1.837. It melts at 44.2° C., and boils at 290° C. It is insoluble in water, soluble to a slight extent in olive oil and in ether, freely in carbon disulphid. **Red** or **amorphous phosphorus** is formed when ordinary phosphorus is heated to 240° C., in an atmosphere free from oxygen; also by the addition of a trace of iodin at 200° C. It is a dark red powder, having a specific gravity of 2.11, insoluble in carbon disulphid, noninflammable, nonluminous, and nonpoisonous. **Metallic rhombohedral phosphorus** is an allotropic form produced by heating phosphorus in a sealed tube with melted lead. Its specific gravity is 2.34. Other modifications have been described. Phosphorus combines with other elements to form phosphids; with hydrogen and oxygen to form a series of acids, known chiefly through their salts.

Therapeutics.—Medicinally, phosphorus is used as an alterative in osteomalacia, rickets, and ununited fractures. It is also employed in sexual impotence, in threatened cerebral degeneration, in neuralgia, and in convalescence from exhausting diseases. Dose, 1/150 to 1/50 grain.

Poisoning.—Ordinary phosphorus is exceedingly poisonous; it causes a widespread fatty degeneration, most marked in the liver. Vomiting is one of the earliest symptoms, the material ejected being generally luminous in the dark. Jaundice appears usually within 36 hours; sometimes, however, much later. The liver is at first enlarged, but subsequently diminishes in size. Cerebral symptoms of an intense type occur—wild delirium, convulsions, coma. Death is generally due to failure of respiration and circulation. The urine in phosphorus-poisoning is albuminous, contains bile acids and pigments, and leucin and tyrosin. Chronic phosphorus-poisoning is common among workers in match factories. A prominent symptom is necrosis of the jaws. See JAWS (Diseases).

The treatment of phosphorus-poisoning consists in the administration of emetics and purgatives and of the antidote—copper sulphate or old French oil of turpentine.

Preparations.—**Acidum Hypophosphorosum,** a liquid composed of 30 percent by weight of absolute hypophosphorous acid, H_3PO_2, and 70 percent of water. **Acidum Hypophosphorosum Dilutum,** a liquid composed of 10 percent of the absolute acid and 90 percent of water. Used in the preparation of Syrupus hypophosphitum. Dose, 5 to 10 minims. **P. Pilulæ,** each contain phosphorus 1/100 grain dissolved in chloroform, mixed with althæa and acacia in glycerin and water, and coated by shaking with a solution of balsam of tolu in ether. Dose, 1 to 2. **Calcii Hypophosphis,** colorless prisms, or thin, pearly scales, of nauseous taste, soluble in 6.8 of water, insoluble in alcohol. Is an ingredient of the syrupus hypophosphitum. Dose, 5 to 15 grains. **Ferri Hypophosphis,** a white or grayish-white powder, odorless and tasteless, slightly soluble in water. A ferruginous tonic. Dose, 1 to 5 grains. **Mangani Hypophosphis,** a pink, crystalline powder, soluble in water, almost insoluble in alcohol. Dose, 1 to 5 grains. **Potassii Hypophosphis,** white masses, or a white granular powder, deliquescent, odorless, of saline taste and neutral reaction. Soluble in 0.6 of water and in 7.3 of alcohol at 59° F. Dose, 5 to 10 grains. **Sodii Hypophosphis,** small plates, or a white, granular powder, deliquescent, odorless, of sweetish, saline taste, and neutral reaction. Soluble in 1 of water and in 30 of alcohol at 59° F. Dose, 5 to 30 grains. **Syrupus Hypophosphitum** has of calcium hypophosphite 4 1/2, of potassium and sodium hypophosphites 1 1/2 each, percent. Dose, 1 to 4 drams. **Calcii Phosphas Præcipitatus,** a light, white amorphous powder, insoluble in water or in alcohol. Dose, 2 to 30 grains. **Syrupus Calcii Lactophosphatis** has of calcium carbonate 2 1/2, lactic acid 6, phosphoric acid 3.6, percent. Dose, 1 to 4 drams. **Sodii Phosphas,** large, colorless, monoclinic prisms, efflorescent, of saline taste and alkaline reaction; soluble in 6 of water, in 1 1/2 of boiling water; insoluble in alcohol. Its solubility in water is much increased by the addition of citric acid. Dose, 20 grains to 2 drams. **Sodii Phosphas Exsiccatus** is the crystallized phosphate allowed to effloresce, and then gradually heated to 212° F. until the salt ceases to lose weight. Dose, 10 to 20 grains. **Sodii Phosphas Effervescens** has of the exsiccated salt 20, sodium bicarbonate 47 3/4, tartaric acid 25 1/4, citric acid 16 1/4. Dose, 1 to 3 drams. **Liquor Sodii Phosphatis Compositus** has of the phosphate 100, sodium nitrate 4, citric acid 13, water to 100. Dose, 1 to 3 drams. **Sodii Pyrophosphas,** colorless, monoclinic prisms, of saline taste and alkaline reaction; soluble in 12 of water, insoluble in alcohol. Dose, 10 to 45 grains. **Elixir Ferri, Quininæ Strychninæ Phosphatum** has 1/64 grain of strychnin in each dose of 1 dram. Dose, 1/2 to 2 drams. **Glyceritum Ferri, Quininæ et Strychninæ Phosphatum** has in each dose of 15 minims 1/80 grain strychnin. Dose, 10 to 20 minims. **Syrupus Ferri, Quininæ et Strychninæ Phosphatum** has in each dose of 1 dram 1/80 grain strychnin, and is prepared by mixing the glycerite 25 with syrup to 100. Dose, 1/2 to 2 drams. **Ferri Phosphas Solubilis,** and **Ferri Pyrophosphas Solubilis** are described under IRON. For glycerophosphates, see GLYCEROPHOSPHORIC ACID.

PHOTOMICROGRAPHY.—A photograph of a small or microscopic object, usually made with the aid of a microscope, and of sufficient size for observation with the naked eye. A microphotograph is a microscopic (in size) photograph.

Apparatus.—Different varieties have been devised; possibly the simplest consists of a camera with extra long bellows length and stable base or support upon which the microscope can be clamped. Of the different varieties, the horizontal, the reversible, and the reversible in a vertical position have been described. While sunlight is preferred, light derived from a paraffin lamp, incandescent gas, magnesium oxyhydrogen, acetylene or electric light will do. An apparatus which may be used in either the vertical or horizontal position is offered by the leading microscope makers in America and abroad. A compound microscope with larger diameter body tube is preferable.

The camera is so made that bellows is adjustable at both ends along its supporting bed bar attached to the heavy base which supports also the microscope in relation to the bellows so that the sensitive plate may at all times be kept parallel to the specimen under the microscope whether bellows stands vertically, inclined or in a horizontal position. The double plate carrier is the usual 4 by 5 inches size with kits for 3 1/4 by 4 1/4 plates. Any of the hand camera shutters may be used on the front board; a light-tight connection is provided between shutter and microscope tube. Where artificial light is used simply the lamp with bull's eye lens separately or in combination will do. A more elaborate illuminating system of lamp and condensers as supplied on projection lanterns is used quite often. A dark room is necessary only for loading plate holders and developing plates after exposure. Depending upon the size of the objective and character of specimen, also light intensity, exposures from 1/25 second to 10 minutes are made.

Practical Manipulation (Crookshank).—For working with the paraffin lamp, the mode of procedure is, as regards the illumination, briefly as follows: The substage condenser, as well as the mirror, is dispensed with when a low power is employed, and the lamp is so placed that the image of the flat of the flame appears accurately in the center of the field of the microscope. A bull's-eye condenser is then interposed, so that the image of the flame disappears and the whole field is equally illuminated. With high powers the substage achromatic condenser is necessary, and a more intense illumination is obtained by using the flame edgewise. In using a low power with the oxyhydrogen light, the lantern is withdrawn some little distance from the microscope. By opening and closing the shutter of the camera, the plate is exposed usually about 3 seconds.

Determination of amplification varies with the object employed, and also with the distance of the focusing screen from the object. To determine the amplification afforded by a certain objective at a certain distance, a photograph should be taken, under the same conditions, of the lines of the micrometer slide. From this calculate the amplification obtained by the photomicrograph.

PHOTOPHOBIA.—A dread or intolerance of light, usually due to some inflammation of the eye. It is particularly common in strumous children with phlyctenular disease of the cornea. It may be present in any inflammatory condition of the eye, whether of the conjunctiva, cornea, iris, ciliary body, choroid, or retina. In many cases it is directly due to uncorrected ametropia. In such instances the constant use of tinted glasses is most pernicious. Photophobia is often associated with diseases of the nervous system, cerebral iritation, meningitis, etc. It is also seen in many pyrexial conditions. See Eye.

PHOTOTHERAPY (Light Therapy).—The treatment of disease by light rays. The beneficent effects of light upon the debilitated body have long been recognized. Besides the ordinary **sun-bath**, various means of using artificial light have been proposed. To the chemic properties of the ultraviolet rays are attributed the good effects of the **electric-light bath.** The functions of the organism are stimulated without elevation of temperature and consequent disturbance of circulation.

At the present time, the term phototherapy is more strictly used to designate the treatment of skin-diseases and other affections in the manner devised by Finsen, of Copenhagen. This investigator treated the exanthems of small-pox and other eruptive diseases by means of red light. As the "chemic" (blue, violet, and ultraviolet) rays of light are capable of causing an inflammation (erythema solare) of the healthy skin, it may be assumed that they are equally capable of aggravating preexisting inflammations. In other words, if the diseased skin was protected against the injurious action of the chemic rays of light, it would be possible to diminish the intensity of the inflammation, and thus prevent suppuration. The object was therefore to exclude the chemic rays of light which are injurious to the skin. In a new treatment of lupus and other bacterial skin-diseases devised by Finsen, these rays are now used as curative agents. The method consists in treating local superficial bacterial skin-diseases by the concentrated chemic rays of light. Bie, an assistant of Finsen, published a description of the method and technic, and it is from his paper that the material for the present article has been obtained.

The experimentally proved data on which the method is founded are the following:

1. The bactericidal property of the chemic rays of light.
2. The power of the chemic rays of light to produce an inflammation of the skin (erythema solare).
3. The power of the chemic rays of light to penetrate the skin.

The Bactericidal Property of the Chemic Rays of Light.

The bactericidal property of light, originally demonstrated by Downes and Blunt, has more recently been studied in detail by a great many investigators. The particular question which is of the greatest interest in this connection is the following: Whether the bactericidal property is essentially attached to a single part of the spectrum, or whether it resides only in the whole uncolored light. The most trustworthy examinations have given the result that it is especially due to the blue and violet rays. If it is desired to employ the bactericidal property of the light therapeutically, the greatest possible number of violet and ultraviolet rays must be procured. On the other hand, the red, yellow, and green are useless.

Another condition for the advantageous use of the bactericidal property of the light therapeutically is that the bacteria are quickly killed. Finsen has found that on days of bright sunshine at noon in July and August in Copenhagen, the sunlight killed the bacillus prodigiosus in plate-cultures within 1 1/2 hours of insolation. An electric arc-lamp of 25 amperes killed a plate-culture of the bacillus prodigiosus at a distance of 75 cm. from the carbon points after 8 to 9 hours' exposure.

Even the strongest sunlight in summer—which takes more than 1 hour to kill the bacteria in plate-cultures, and probably still longer when they are growing in the skin—has then too slight a bactericidal property ever to be of any use for therapeutic purposes, otherwise all bacterial skin-diseases would be cured spontaneously in the summer. In order to obtain a more energetic effect, Finsen concentrates the light by means of apparatus, which is described later. It is only when the light is concentrated in such a way that it contains as many blue, violet, and ultraviolet rays as possible that its bactericidal property becomes so powerful that it can be used therapeutically with advantage. Concentrated electric light, which Finsen now uses for the treatment of patients, kills the bacteria until now examined in a few seconds when they are spread in a stratum of agar about 1/5 mm. thick.

The Power of the Chemic Rays of Light to Produce an Inflammation of the Skin.

The old name of erythema solare (erythema caloricum) proves that this disease was supposed to be due to a too intense heating of the skin consequent on the heat that always is inseparable from the light. Widmark (Stockholm) first experimentally showed the error of this view. He concentrated the electric light into parallel rays by means of a lens of quartz, and applied them to the skin, after they had passed either through a layer of distilled water, which absorbs the ultrared rays (dark rays of heat) or through a glass plate, which absorbs a large part of the ultraviolet rays. It turned out to be immaterial whether the light contained the ultrared rays or not; on the other hand, the absorption of the ultraviolet rays by the glass plate prevented completely the appearance of the inflammation. The experiments of Widmark prove, then, that the ultraviolet rays are of predominant importance in regard to producing light erythema. Later researches made by Finsen have confirmed this, and further he has proved that the blue and violet rays have also the power to produce the specific photochemic inflammation, but in a slighter degree than the ultraviolet rays. It is still impossible to decide finally of what importance this photochemic erythema is in regard to treating bacterial skin-diseases with concentrated chemic rays of light; but that, at any rate, it is not quite insignificant for the treatment of lupus vulgaris may well be considered probable, in view of the trials made of other methods of treatment which tend to cause an inflammation of the skin.

The Power of the Chemic Rays of Light to Penetrate the Skin.

This point has been investigated by Godneff and Finsen. With a trocar Godneff placed small sealed glass tubes with silver chlorid under the skin of dogs and cats. Then he allowed some of these animals to remain in the dark, while he exposed the rest of them to the direct sunlight. After an hour he took out the tubes; and it was invariably found that the silver chlorid was blackened in those animals exposed to the sun, but not in those kept in the dark. The chemic rays of light can then penetrate the skin. Finsen thus proved that they penetrate far more easily in bloodless tissues than those filled with blood. He placed a piece of sensitized paper on one side of a man's ear, letting the blue and violet rays of one of his apparatus for concentration of sunlight fall on the other side of the ear. After 5 minutes this paper was not affected; on the other hand, the paper was distinctly blackened in 20 seconds, if all the blood was pressed out of the ear between 2 glass plates. In agreement with this is the fact that by looking into a spectroscope through an ear filled with blood the observer will only discover a red stripe; if the ear is made anemic, the spectrum will consist of all the colors. Accordingly, the area of the skin that is going to be treated is made as anemic as possible.

Description of the Apparatus.

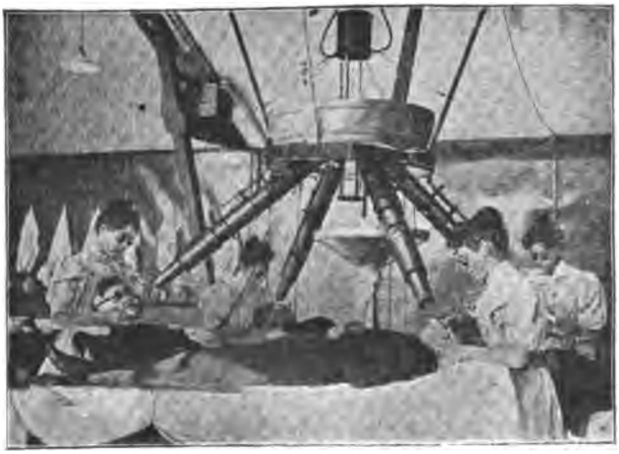
Based as it is on these three experimentally proved facts, this method of treatment is so rational that objections can scarcely be raised against it from a theoretic point of view. In the treatment of patients sunlight is used in the summer, when the sky is bright, otherwise the light of electric arc-lamps of 50 to 80 amperes. As already explained, it is only by concentration that the light becomes so powerful that its bactericidal property can be used in treatment. In order to avoid burning the skin it is also necessary to cool the light. This double object—to make the light stronger and cooler—is attained, in regard to the sunlight, by an apparatus consisting of a lens of about 20 to 40 cm. in diameter. The lens is composed of a plane glass and a curved one, which are framed in a brass ring, and between them there is a bright blue, weak, ammoniacal solution of copper sulphate. As one surface of the liquid is a plane, the other one being curved, its optic function is that of an ordinary planoconvex glass lens. By making the lens of a blue liquid instead of solid glass, a considerable cooling of the light will be obtained, because water absorbs the ultrared rays, and because the blue color excludes a considerable amount of the red and yellow rays. These three kinds of rays have particularly strong heating effect, while their bactericidal power is insignificant. On the other hand, the blue, violet, and ultraviolet rays, which it is important to procure in as great a number as possible, are but very slightly impaired by passing through the blue liquid. The lens hangs on a foot, made in such a way that th lense can be raised and lowered as well as turned on a vertical and horizontal axis; therefore it is easy to place the lens perpendicularly on the sun-rays, and at such a distance as to make the light strike the area of skin which it is intended to treat.

The apparatus for concentrating the electric arc-light consists of lenses of quartz framed in two brass tubes, which can be moved, the one into the other, like the two pieces of a telescope. Lenses of quartz are used because this material, in a far higher degree than glass, allows the ultraviolet rays to pass through. The apparatus for concentrating the sunlight may, on the other hand, be made of glass, because all the ultraviolet rays of the sunlight have so long a wave-length that they can pass through glass; those of a shorter wave-length are already absorbed by the atmosphere.

Treatment by Sunlight.

In the part of the apparatus which faces the lamp, two lenses are placed that have together a focal distance of 12 cm.; when the apparatus is placed in such a way that the first lens is exactly at this distance from the points of the carbons of the lamp, they consequently will concentrate the divergent rays coming from the lamp and make them parallel; these rays pass through the brass tubes, at the distal end of which they meet again with two lenses of quartz, which concentrate the parallel rays, making them convergent. Between these two quartz lenses there is distilled water, which cools the light by absorbing the intensely heating ultrared rays, but does not impair the blue, violet, and ultraviolet ones. It is not possible, as in the apparatus for the sun, to make the water blue in order to cool the light further, because the extreme ultraviolet rays, which abound in the electric light, may well pass the quartz, but get absorbed by the blue coloring matters; the advantages of using the lenses of quartz would consequently be lost if the light got cold through a blue solution. Of course, the distilled water between the quartz lenses is heated by the absorption of the ultrared rays. In order to avoid too much heating (boiling), cold ordinary water may be run through the mantle surrounding this end of the apparatus.

Four such apparatus for concentrating are fixed to an iron ring around each lamp, this ring again being fixed to the ceiling by 4 iron supporters. The lamp is movable up and down by the mechanism, and can be put exactly into the center of the ring by the aid of four strings, which are connected with screws in the iron support. The apparatus for concentrating hangs on iron arms, fastened to the ring, and depends from this at an angle of about 45 degrees, because the lamp sends out the strongest light in this direction; the apparatus for concentrating can be put nearer to or further from the lamp by sliding on the iron arm. By this disposition the lamp and the apparatus for concentrating can be fixed so that the points of the carbons are exactly in the focus of the front lenses of all the four apparatus. The apparatus for concentrating can be revolved on a perpendicular axis and a horizontal one by 3 screws; by this they can be so placed that the axis of the apparatus gets fused with the axis of the parallel rays, so that no light is striking the brass cylinders. The distant focus can be placed at the height which suits the patient by pushing the lowest cylinder into the uppermost one of the concentration apparatus.


Treatment by Electric Light.

Through the two forms of apparatus for concentrating described, the concentrating and cooling of the light are thus affected. But the light is still too warm to be applied to the skin without hurting it; the skin must therefore be cooled in order to avoid burning. This is effected by a little apparatus consisting of a plate of quartz and a plain convex lens of quartz, both framed in a conic brass ring which carries 2 small tubes and 4 arms; to each arm is fastened an elastic band, by means of which the apparatus is pressed against the skin. By making cold water run into one of the tubes and out of the other one, the skin would be cooled to such a degree that it can stand even the strongest light. By the pressure which the planoconvex quartz lens excites on the skin this is made anemic, so that the chemic rays penetrate it much better. In this manner an area of skin 1 1/2 cm. in diameter is treated for 1 hour each day. The treated skin reddens and swells, a bulla may appear, but necrosis has never been observed. The illustrations on the previous page show the arrangement of the apparatus for treatment.

Results of Treatment.

Finsen has tried to treat different skin-diseases, known or supposed to be of microbic origin, but it is only of lupus vulgaris, lupus erythematosus, and alopecia areata that he has treated a number of cases sufficiently great to estimate the value of the method.

Lupus Vulgaris.—Up to the time of publication of the first edition of this work about 350 cases of this disease altogether had been treated. The first patients were treated entirely by light; the same thing is done with all the slighter cases; on the other hand, in the more serious cases the treatment by light is assisted by treatment with pyrogallic acid ointment in order to make the skin smooth and as easily penetrable by the light as possible. While one part is being treated by light, the pyrogallic acid ointment is put on another part; when the cauterization is healed by a zinc ointment, this area of skin is treated by light; this treatment with ointment is not necessary for obtaining a good result, but it saves much time for the patient. All ulcerations are kept free from crusts by a cataplasm of a boric acid solution. The mucous membranes are touched with a solution of iodin and potassium iodid (1:2:2), or are treated with the galvanocautery. Only the skin, the hard palate, the front part of the septum nasi, tongue, and the mucous membrane of the cheek have been healed by this method.

In none of the cases was the treatment without effect, but in about 5 cases the improvement was very slow, either because the disease was progressing so rapidly that it was extending in one place while the treatment went on in another, or because the lupus was so deep that the light could only with difficulty penetrate to it. In all the 350 other cases the result of the treatment has been satisfactory. Of course, it takes some time—until all the diseased tissue is thoroughly treated and the formation of scar tissue has begun—before any improvement is visible; but from the moment it begins it is continued without interruption until the last nodule of the lupus patch has disappeared. In all these 350 cases this result was so certain and so constant that there is even reason to doubt the accuracy of the diagnosis of lupus vulgaris when this method of treatment appears to be ineffective.

The principle advantages of the method are, besides its reliability, its excellent cosmetic results, the infrequency of relapses and their slight extent, and that the treatment is painless. The good cosmetic result is due to the fact that there is no destruction of tissue, healthy or diseased. It is for the same reason that the results in respect to relapse are so favorable. One may, without harm, treat both the diseased tissue and the apparently healthy surrounding skin until one is fairly sure of having destroyed all the disease-germs. When the patient has been treated until there are no distinct nodules of lupus to be seen at the moment, the treatment is discontinued until the swelling and redness of the skin have disappeared, so that it is easier to determine whether anything is left of the disease or not. If there is nothing visible, the patient is still kept under observation. Many must, however, be submitted to a second course of treatment. Whether the nodules which develop are the result of recurrence, or whether they could not earlier be recognized as lupus nodules, is a matter of little consequence in itself. The principal thing is that there have always until now been a few scattered nodules, which disappear after a short further course of treatment. If the treatment is carried on for some time after the last nodule of lupus seems to have disappeared, recurrence would be more surely guarded against. The fact that the treatment is discontinued as soon as it is thought justifiable to do so, is due solely to the wish to save the time and the money of the patients as far as possible. Inasmuch as the efficacy of the treatment is absolutely certain, and the patients, on account of its painlessness, are very willing to submit themselves to a second course, a recurrence is not nearly so serious a matter as it is after the older methods of treatment.

Lupus Erythematosus.—The treatment of this disease has in many cases given excellent results—permanent recovery and firm scars. Nevertheless, the effect of the treatment is not nearly so sure as it is in the case of lupus vulgaris. A few cases have improved very slowly and with a constant tendency to recurrence. What the cause of this great individual difference may be it is still impossible to determine, if for no other reason, because we have not a sufficiently great material (altogether only 28 patients).

Alopecia Areata.—As the indication for the treatment by concentrated chemic rays of light is that the disease must be superficial, local, and bacterial, and as it is at least possible that alopecia areata is due to an infection, Finsen has tried to treat this disease. In January, 1899, when the first experiments were published in Danish, 7 cases in all had been cured.

On the whole, the trials made until now look promising. Whether all the fresh cases will give results as satisfactory as in those described can be solved only by further experiments. To judge from the later experiments, even the old decalvans form seems to be curable, though only after a long treatment (Bie).

Roentgen rays have been used in same manner and for conditions similar to those treated by Finsen, as well as for epithelioma.

Light Cabinets.

These are closed wooden compartments, in which the patient sits or stands, allowing only the head to protrude. Upon the inside of this cabinet is distributed a number of incandescent lamps (25 to 100).

All observers probably agree that the light cabinet is one of the best forms of sweat-bath, in that the perspiration breaks out more quickly and at a lower temperature than in other baths. Following the artificial sweating process there is a reduction in blood-pressure. The indication for treatment may be judged by these two physiological processes.

High power incandescent lamps consist of incandescent lamps of 300 to 600 candle power surrounded by reflectors which cause the rays to cross at certain points, or areas of intensification. They are used with a fair degree of success in the treatment of eczema, pruritis, impetigo, nevus, ichthyosis, herpes simplex, herpes zoster, tinea, psoriasis, carbuncle, acne, furunculosis, etc.

For the treatment of the above conditions the light from these lamps is brought close enough to produce a destructive effect, or far enough away to obtain only a stimulant effect. In the former, the surrounding tissues are protected by asbestos. The applications vary from a few seconds to 15 or 20 minutes.

These lamps are also used for the relief of painful conditions about the joints and muscles. The effect is due chiefly to the heat.

Conclusions.

A more recent critical review by Bie leads him to the following conclusions:

Biologic Effects.—(1) The chemic rays, except the red, yellow and green can cause a burn of the skin (Bouchard, Widmark and Finsen). (2) The ultraviolet rays cause an enlargement of the cutaneous vessels which may last at least five or six months. (3) There is nothing to show that light has any influence upon the quantity of hemoglobin in the blood. (4) The assertion of Moleschott and of others that light increases the excretion of carbon dioxid cannot be counted as proved. (5) Chemic rays of light have an exciting influence on lower animals, light has probably a similar exciting influence on men; according to some investigators red light has an exciting effect and the violet rays have a quieting influence on psychic processes, a property which has been made use of with success for quieting maniacal patients. (6) The red light-rays can penetrate the organism deeply; the blue and violet rays can only penetrate the tissues when they are bloodless; the ultraviolet rays cannot penetrate farther than the superficial layers of the skin. (7) The same is true of the power of light to kill bacteria in the organism, a power which pertains almost exclusively to the chemical rays, having, therefore, curative effect only on superficial affections; there can therefore be no use trying to kill tubercle bacilli in the larynx or in the lungs by transmitted light, as some American physicians have proposed doing.

Therapeutic Effects.—(1) Finsen's treatment of small-pox with red light is based on this, that by the exclusion of the inflammatory influence of the chemic rays on the skin the formation of pus in the vesicles and also secondary fever and pocks are prevented. (2) The treatment of other exanthematous diseases by red light has not yet been thoroughly investigated. Bachmann and Chatiriere have obtained favorable results in the treatment of measles, and Krukenberg in the treatment of erysipelas. (3) The incandescent sweat-baths constructed by Kellogg must be considered as nothing more than sweat-baths which have no specific effects. In this connection, however, there seems to be unity of opinion that they are the most complete of all sweat-baths. (4) The local illumination by incandescent or arc-lamps, made by various Russian physicians, especially Minin, have no claim on our attention. (5) The general light therapy of the future will undoubtedly be sun-baths without subsequent packing, or electric arc light-baths 150 to 200 amperes with sweating. We know at present too little of the general effect of light for us to be able to fix definite indications. (6) The only local application whose efficiency has been proved is Finsen's treatment of skin-disease with concentrated chemic light-rays. The excellent cosmetic results obtained are to be ascribed to the fact that the method is the most complete imaginable; nothing is destroyed; there is no shrinking; the scars are white and smooth; also, as the result of this treatment, not only can the diseased tissues be treated, but the contiguous sound tissues as well; in this way danger of recurrence is lessened; the treatment is painless; the curative effect is remarkable. In 640 patients the treatment had to be stopped on account of bad results in only 1.7 percent while 85 percent show an absolutely favorable result. Only in the case of 15 percent was the improvement so slow that the result could be considered as less favorable. The recurrent conditions are favorable under the treatment. In lupus erythematosus the results were somewhat uncertain. In alopecia areata, nævus vascularis, acne vulgaris, acne rosacea, and epithelioma cutaneum very favorable results were obtained, especially when it is considered that the cases were almost always severe, such as could be cured by no other treatment.

PHTHISIS.—See TUBERCULOSIS.

PHYSOSTIGMA (Calabar Bean; Ordeal Nut).—The seed of *P. venenosum*, native of West Africa. The properties of the drug depend upon 2 alkaloids, **physostigmin** or **eserin**, $C_{15}H_{21}N_3O_2$, which paralyzes the motor functions of the spinal cord and stimulates muscle-fiber, and **calabarin**, which acts similarly to strychnin. Physostigma should contain not less than 0.15 percent of alkaloids soluble in ether. Dose, 1 to 3 grains. Applied locally to the eye, physostigmin causes contraction of the pupil and diminishes intraocular tension. On account of its action on muscles it causes increased peristaltic movements of the intestines.

In toxic doses death is produced by failure of respiration.

Its therapeutic uses are: In diseases of the eye, as in glaucoma and in iritis, to contract the pupil, and, alternated with atropin, to break up adhesions after iritis; in convulsive diseases, as tetanus and strychnin poisoning; in constipation from atony of the intestines; in bronchitis and dyspnea, from weakness of the bronchial muscles. It is also used as an antidote to atropin and to strychnin.

For poisoning give an emetic and inject atropin.

In tetanus:

℞. Extract of physostigma, gr. iij
Powdered ginger, gr. vj.
Make 6 pills. One pill every hour.

To procure sleep in delirium tremens:

℞. Tincture of physostigma, ♏ xx
Water, ℥ j.
To be taken at one dose.

Preparations.—**Extractum Physostigmatis,** an alcoholic extract, of which the usual dose is 1/16 to 1/4 grain, but 1 to 4 grains are used in tetanus. **Tinctura Physostigmatis,** 10 percent. Dose, 5 to 20 minims. **Physostigminæ Salicylas,** *eserine salicylate,* colorless, columnar crystals, of bitter taste and neutral reaction, soluble in 150 of water and in 12 of alcohol. Dose, 1/100 to 1/30 grain. **Physostigminæ Sulphas,** *eserine sulphate,* a white, microcrystalline powder, of bitter taste, very deliquescent in moist air, very soluble in water and in alcohol. Dose, 1/100 to 1/30 grain. See Eserin.

PHYTOLACCA.—The dried root of *P. decandra.* It contains a neutral principle, *phytolaccin,* and an acid, *phytolaccic acid,* also tannin, starch, fixed oil, etc. Dose, as an alterative, 1 to 5 grains; as an emetic, 10 to 30 grains. It is an emetic, cathartic, and motor depressant. Toxic doses cause death by paralysis of the organs of respiration. Its action is antagonized by alcohol, opium, and digitalis. It is serviceable in chronic rheumatism, mastitis, tonsillitis, malignant tumors, eczema, and similar skin affections. It has also been used as a remedy for obesity. Fluidextract of Phytolacca. Dose, as an alterative, 1 to 4 minims; as an emetic, 10 to 30 minims.

PICA.—The craving for unnatural and strange articles of food: a symptom present in certain forms of insanity, in hysteria and chlorosis, and during pregnancy. Pica is especially urgent during the first 2 or 3 months of pregnancy. It is popularly known as "longings" or "pinings." In exceptional cases it may amount to insanity, and injurious substances—sometimes very disgusting ones—are eagerly partaken of. Regulation of the digestive tract, combined with moral suasion and some mental diversion, are about all that can be tried in the way of treatment. With the end of pregnancy the condition ceases.

PICRIC ACID, *carbozotic acid, trinitro-phenol,* $C_6H_2OH(NO_2)_3$, occurs in yellow scales which are soluble in 75 of water. Externally it is antiseptic, analgesic, coagulant, and in solution is nonirritant to the tissues, but is too corrosive for internal use. A saturated aqueous solution is highly recommended as a local application in erysipelas and burns, and is an efficient test for albumin in the urine. *Ammonium picrate* has been credited with antiperiodic and anthelmintic powers, and is highly praised in pertussis and in exophthalmic goiter, in doses of 1/8 to 1/2 grain thrice daily.

PILES.—See Hemorrhoids.

PILLS (Pilulæ).—Spherical masses composed of medicinal agents and intended to be swallowed whole. The *mass* consists of the active ingredients and the *excipient,* the latter being the substance which gives the mass its adhesive and plastic qualities.

There are 14 official pills:

Title.	Constituents.	Dose.
Pilulæ:		
Aloes	Purified aloes and soap, each 13 gm., in 100 pills.	As a laxative, 1, 2, or 3 pills at bedtime; as a purge, 5 pills.
Aloes et Ferri	Purified aloes, iron sulphate and aromatic powder, each 7 gm.; confect. rose, q. s., in 100 pills.	2 pills.
Aloes et mastiches (Lady Webster dinner pills).	Purified aloes, 13 gm.; mastic, 4 gm.; red rose, 3 gm.; in 100 pills.	2 pills.
Aloes et myrrhæ	Purified aloes, 13 gm.; myrrh, 6 gm. aromatic powder, 4 gm.; syrup, q. s. 100 pills.	From 3 to 6 pills.
Asafœtidæ	Asafetida 20 gm.: soap, 6 gm.; 100 pills.	3 pills.
Catharticæ compositæ.	Compound extract of colocynth, 80 gm.; calomel, 60 gm.; jalap (resin), 20 gm.; gamboge, 15 gm.; 1000 pills.	2 pills.
Catharticæ vegetabiles.	Compound extract of colocynth, 60 gm.; extract hyoscyam., 30 gm.; resin of jalap, 20 gm.; extract leptandra, 15 gm.; resin podophyllum, 15 gm.; oil of peppermint, 8 c.c. in 1000 pills.	2 pills.
Ferri carbonatis (Ferruginous pills, chalybeate pills. Blaud's pills.)	Ferrous sulphate, 16 gm; potassium carbonate, 8 gm ; sugar, 4 gm.; tragacanth, 1 gm ; althæa, 1 gm.; glycerin and water, q. s. in 100 pills.	2 pills.
Ferri iodidi	Reduced iron, 4 gm.: iodin, 5 gm.; powdered glycyrrhiza, 4 gm.; sugar, 4 gm.; ext. glycyrrhiza, 1 gm.; acacia, 1 gm.; q. s. each water, balsam tolu, and ether. (See U. S. P.)	2 pills.
Laxativæ compositæ.	Aloin, 1.30 gm.; strychnin, 0.05 gm.: extract belladonna leaves, 0.80 gm.; ipecac, 0.40 gm.; glycyrrhiza, 4.60 gm.; syr., 100 pills.	2 pills.
Opii	Powdered opium, 6.5 gm.; soap, 2.0 gm.; 100 pills.	1 pill.

TITLE.	CONSTITUENTS.	DOSE
PILULÆ:		
Phosphori........	Phos., 0.06 gm.; althæa, 6.00 gm.: acaciæ, 3.00 gm.; phosphorus dissolved in chloroform. and made into a pill with about 4 c.c. of a mixture of 2 vol. glycerin, 1 vol. water. Coated with 10 gm. balsam of tolu dissolved in 15 c.c. ether.	1 pill.
Podophylli, belladonnæ et capsici.	Resin podophyllum, 1.6 gm.; extract of belladonna leaves, 0.8 gm.; capsicum, 3.2 gm.; sugar of milk, 6.5 gm.; acacia, 1.6 gm.; glycyrrhiza syr. q. s. 100 pills.	1 pill.
Rhei compositæ..	Rhubarb, 13 gm.; aloes, 10 gm.; myrrh, 6 gm.; oil of peppermint, 0.5 gm., in 100 pills.,	2 pills.

PILOCARPUS (Jaborandi).—The leaflets of *Pilocarpus jaborandi* or of *P. microphyllus*, yielding not less than 1/2 percent of alkaloids. They contain the alkaloids *pilocarpin*, a syrupy fluid, slightly soluble in water, and forming salts; *jaborin*, isomeric with pilocarpin, but antagonistic thereto in action, and does not form crystallizable salts; *pilocarpidin*, which acts like pilocarpin; also a volatile oil, which consists chiefly of *pilocarpene* and a peculiar acid. Dose, 10 to 45 grains.

Therapeutics.—Pilocarpin stimulates the peripheral ends of the secreting nerves going to glands, perhaps also the centers. It thus causes an increased flow of the saliva, marked sweating, secretion of tears, of mucus from the nose and the bronchi; of the gastric and intestinal juices. It also stimulates involuntary muscle. On the vagus it acts as a stimulant, causing slowing of the pulse; in large doses it paralyzes the vagus. Vomiting is produced by jaborandi and sometimes by pilocarpin alone. Pilocarpin causes contraction of the pupil. Its action is antagonized very completely by atropin. Therapeutically, pilocarpin is used chiefly in renal dropsy to produce sweating; also in uremia, for the same purpose. It probably causes an elimination of urea and other waste products, both in the sweat and in the saliva. As a diaphoretic it is also employed in coryza and bronchitis. It has been used most successfully in erysipelas. It may abort the paroxysms of malarial fever, but it is not to be employed in asthenic fevers, as typhoid. In pleurisy with effusion, in catarrhal jaundice of persistent type, in some forms of profuse sweating, and in stimulating hair lotions, it is serviceable. In small doses pilocarpin has been used in tobacco and alcoholic amblyopia. Early in erysipelatous inflammation it may be injected around the border-line of the area of inflammation.

For baldness:

℞. Fluidextract of pilocarpin, ʒ j
Tincture of cantharides, ʒ ss
Soap liniment, ʒ jss.

Apply locally once daily.

Preparations.—Fluidextractum Pilocarpi, Dose, 10 to 45 minims. **Pilocarpinæ Hydrochloridum,** white, transparent crystals, deliquescent in the air, very soluble in water or alcohol. Dose, 1/8 to 1/2 grain. **Pilocarpinæ Nitras,** white, shining crystals, permanent in the air; soluble in 4 of water and in 60 of alcohol. Dose, 1/8 to 1/2 grain.

PIMENTA (Allspice).—The immature fruit of *P. officinalis*. It contains an aromatic, pungent, volatile oil that is much used as a flavor and condiment. It is useful in flatulence and to prevent the griping of purgatives. Dose, 10 to 40 grains. **P., Oleum.** Dose, 2 to 5 minims.

PIMPLES.—See ACNE.

PINEAL EXTRACT.—The pineal gland is present during the entire life of the individual, and its removal in animals has been followed by structural changes in the central nervous system. It is thought that the substance of this gland may act remedially in organic and functional affections of the brain attended with failure of cerebral nutrition, as chronic softening, chronic mania, and dementia. See ORGANOTHERAPY.

PINGUECULA.—A small yellowish growth on the bulbar conjunctiva, close to the cornea, and usually to the inner side. It has no vascular supply, and is pale when the rest of the conjunctiva is congested. Mechanical irritation is the probable cause. There is little discomfort; although it may lead to pterygium no interference is necessary.

PINK EYE.—See CONJUNCTIVITIS (Acute contagious).

PINKROOT.—See SPIGELIA.

PIPER (Pepper).—The dried, unripe fruit of *P. nigrum*. It contains a base, *piperin*, which is official, also a green, acrid, concrete oil, abalsamic, volatile oil, starch, lignin, gum, extractive, etc. Dose, 5 to 20 grains.

Oleoresina Piperis, *oleoresin of pepper*, contains almost all the volatile oil and acrid resin extracted by acetone, with but little of the piperin. Dose, 1/4 to 1 grain.

Piperina, *piperin*, a feeble base obtained from pepper, and other plants of the piperaceæ. Occurs in colorless or pale-yellowish prisms, of neutral reaction, almost insoluble in water, slightly so in ether, but soluble in 30 of alcohol. Dose, 1 to 10 grains.

Pepper when applied to the skin acts as an irritant, internally its effects are similar to those of other aromatics, being a warm carminative and stimulant, increasing slightly the action of the heart, stimulating the kidneys somewhat, and toning up the mucous membrane of the urinary and intestinal passages, by which channels it is eliminated. It has been thought to possess antiperiodic power, and was formerly much employed in intermittents. Its chief medicinal use is to correct flatulence, and to excite action of the stomach, being very commonly taken as a condiment with food. It is occasionally employed in gleet, but more extensively in hemorrhoids and other diseases of the rectum. Its active constituents are the concrete oil or resin and the volatile oil, piperin having very slight action on the system except as an antiperiodic and antipyretic, qualities which it certainly possesses.

PIPERAZIN.—A synthetical basic compound formed by the action of ammonia upon ethylene bromid or chlorid; it occurs as a white, crystalline powder, soluble in water and liquefying when exposed to the air, from which it absorbs water and carbon dioxid. Dose of the base or its hydrochlorid, 5 to 15 grains. It may be injected hypodermically in 3 to 5 percent solution.

Incompatibles are: acetanilid, acetphenetidin (phenacetin), alkaloidal salts, alum, butyl-chloral hydrate, chloral hydrate, copper sulphate, ferric chlorid, ferrous sulphate, mercuric chlorid, phenol, phenocoll, picric acid, potassium permanganate, quinin, silver nitrate, solution of arsenic and mercury iodid, sodium salicylate, spirit of nitrous ether, tannic acid.

It forms with uric acid a soluble compound, is nontoxic, devoid of physiologic effects, and well borne for prolonged periods. It is used in gout, for the prevention of renal and vesical calculi in the uric acid diathesis, to allay the pruritus from uric acid diathesis, and the irritation of the bladder from an excess of uric acid. The usual dose of 15 grains is best given by dissolving this quantity in 1 pint of water, and having the patient drink a wineglassful of this solution frequently through the day. It should not be given in pill nor in powder form. It is patented, and sold at a high price.

PIPERIN.—See Piper.

PIPSISSEWA.—See Chimaphila.

PIRQUET'S (von) TEST.—See Tuberculosis.

PITCH (Pix).—A resinous exudation from the stems of certain trees of the genera *Pinus* (pines) and *Abies* (firs and spruces), and may also be obtained as a residue of the distillation of tar. Its chief constituents are resin and a volatile oil which is a mixture of several isomeric terpenes in varying proportions. The only official form is **Pix Liquida,** *tar,* a product obtained by the destructive distillation of the wood of *Pinus palustris* and other species of Pinus. It is thick, viscid, semi-fluid, blackish-brown, of acid reaction, terebinthinate odor, and sharp, empyreumatic taste; slightly soluble in water, soluble in alcohol, in oils and in a solution of potassa or of soda. Its principal constituents are oil of turpentine, creosote, phenols, pyrocatechin, acetic acid, acetone, xylol, toluol, methylic alcohol, and resins. By distillation it yields an acid liquor, *pyroligneous acid,* and an empyreumatic oil, the residue being pitch. Dose, 5 to 20 grains, in pill, up to 2 drams daily. It is a stimulant to the skin, and is chiefly used locally in skin-diseases, especially those of a scaly nature, such as psoriasis; internally it is of service in chronic bronchitis.

Pix Burgundica, *Burgundy pitch,* the prepared resinous exudation of *Abies excelsa,* the Norway spruce, a native of Europe and Northern Asia. It occurs in hard, brittle, opaque or translucent masses, with a shining, conchoidal fracture, almost entirely soluble in glacial acetic acid; is very fusible, and at the body-heat it softens and becomes adhesive. It is mildly stimulant to the skin, and is used as a basis for plasters. **Oleum Picis Liquidæ,** *oil of tar,* a volatile oil distilled from tar. Dark, reddish-brown (almost colorless when fresh), of tarry odor and taste and acid reaction, readily soluble in alcohol. Contains a great variety of compounds, including cresols, guaiacol, phenol, xylol, toluol, pyrocatechin, methylic alcohol, and acetone. Dose, 1 to 5 minims. **Syrupus Picis Liquidæ,** *syrup of tar,* has of tar 1/2 percent; and is a sweetened tar-water. Dose, 1/2 to 2 drams. **Unguentum Picis Liquidæ,** *tar ointment,* contains of tar 50 parts, yellow wax 15, lard 35. Is irritating unless mixed with finely levigated chalk.

In eczema (dry, scaly):

℞. Solution of coal-tar,
Solution of lead subacetate, } each, ʒ j
Water, enough to make ℥ vj.
Use as a lotion.

Or the following, in hemorrhoids:

℞. Pitch, ʒ j
Powdered acacia, ʒ ss.
Make into 20 pills. Give 2 pills every night.

PITUITARY EXTRACT.—The complete removal of the pituitary body (or gland) gives rise to symptoms which occur in a definite order, beginning with lowered temperature and loss of appetite, then twitchings, tremors and nervous phenomena, and finally dyspnea and death. Many of these symptoms have abated considerably after the administration of pituitary gland substance or an extract thereof. This organ has been found enlarged in cases of myxedema in which the thyroid was functionally absent, and other observations point to some connection between it and the disease known as acromegaly. Internally administered it causes increase of the cardiac force, and a rapid rise of blood-pressure due to direct contraction of the vessels and slowing of the pulse; also increased elimination of phosphates without corresponding increase of the nitrogenous elements. It has been administered with the view of reestablishing perverted brain nutrition and function, also with the object of supplying tone and structural growth to the entire nervous and muscular systems, on which its secretion seems to act as an alterative. Of 13 cases of acromegaly treated with pituitary preparations 7 showed varying degrees of improvement, 5 none, and 1 became worse. In 2 cases the violent headache and neuralgic pains in the limbs were diminished, and in one case decrease of the affected extremities occurred (Kinnicut). It has been tried in epilepsy, but with no benefit, and there is no condition known in which it is of therapeutic use (Wood).

PITYRIASIS.—A term formerly applied to various pathologically dissociated skin affections, the most striking clinical feature of which is the presence of fine, branny desquamation. Also a synonym of Seborrhea (*q. v.*). See Dermatitis, Lichen Ruber, etc.

PITYRIASIS CAPITIS.—See Eczema Seborrhoicum.

PITYRIASIS RUBRA PILARIS.—A rare skin disease, a hyperkeratosis, closely resembling Lichen Ruber (*q. v.*) but differing from that disease in the absence of systemic disturbance, in the paler color of the lesions, in the absence, practically, of itching and atrophic changes, and in the fact that it is not amenable to arsenical treatment.

PLACENTA PRÆVIA.—The attachment of the placenta to any part of the lower uterine segment. It occurs once in about 1500 cases.

Varieties.—Four varieties of placenta prævia are described, dependent upon its relation in situation to the internal os. These are named *central*, *partial*, *marginal*, and *lateral*.

Causes.—These are obscure, the most probable being that it is caused by a low insertion of the ovum, this being due to a preexisting endometritis. It is three times as frequent in multiparæ as in primiparæ.

Symptoms.—The one symptom of placenta prævia is hemorrhage. The time of its appearance, the amount, and the frequency are largely dependent on the variety. In the central variety the bleeding may occur as early as the third month, and may recur so frequently and profusely as to cause speedy death. In the lateral variety hemorrhage may not appear at all. Usually there will be a slight, painless hemorrhage during the latter half of pregnancy, which is followed, as the woman approaches term, by others which appear at decreasing intervals and in increasing amounts.

Physical Signs.—Before the os is dilated, the cervix is found particularly soft and large, and the presenting part is felt through the vaginal vault as though separated from the examining finger by a thick cushion or pad. After the os is dilated, the rough, maternal surface of the placenta is felt in striking contrast to the smooth, elastic membranes.

Prognosis.—This is grave for both mother and child. In general practice the maternal mortality is about 30 percent. Repeated loss of blood during pregnancy and at labor, lessened vitality, and low situation of the placental site, favoring sepsis, are all unfavorable factors. The infant mortality is about 60 percent. Asphyxia, hemorrhage, and accidents during delivery are accountable for this high death-rate.

Treatment.—The treatment of placenta prævia will depend upon the severity of the hemorrhages, and upon the time at which they make their appearance.

If the bleeding occurs early in pregnancy; if it is slight in quantity; and if it is not repeated too frequently, rest in bed and the administration of opium suppositories, 1 grain of the aqueous extract 3 times daily will be sufficient. Should the bleeding continue or increase in quantity, a firm tampon of iodoform gauze must be introduced into the vagina. This usually leads to abortion or miscarriage, and its subsequent treatment is the same as that described under Abortion (*q. v.*).

Should the patient pass successfully the seventh month of gestation, and should serious hemorrhage now occur, the induction of premature labor by rapid dilatation of the cervix and combined version are indicated. The patient is anesthetized, and the vulva and vagina are thoroughly cleansed. The operator introduces his right hand, made aseptic, into the vagina; the cervix is rapidly dilated until 2 or 3 fingers may be introduced into the uterus, when a foot is grasped and the child extracted to the knee. This allows the soft breech of the child to lodge in the lower uterine segment, where it exerts sufficient pressure upon the placenta to prevent free bleeding, and at the same time does not interfere materially with the exchange of blood between mother and child. Labor pains now appear, and the subsequent treatment is the same as in an ordinary breech presentation.

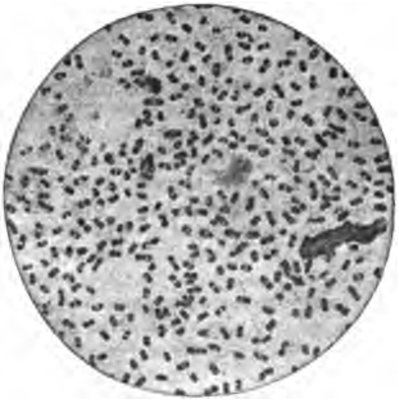
Should the operator feel incapable of performing version, or should the patient be seen in the midst of a most alarming hemorrhage, when further loss of blood might seriously endanger her life, the most effective treatment is a large antiseptic vaginal tampon. This usually excites labor pains, and the tampon is expelled before the advancing head. Should it fail to do this, the tampon will have to be renewed occasionally, until the os is dilated sufficiently to effect easy delivery.

The treatment at term is the same as that previously described—either combined version or a large vaginal tampon. The latter method usually sacrifices the life of the child.

PLAGUE. Synonym.—Pest. It is qualified as Oriental, Egyptian, Levantine, or Pâli plague. Mâhamâri (northwest India) is plague.

Definition.—An acute specific fever, common to man and some of the lower animals, usually atetnded with painful swelling of a group of superficial lymphatic ganglia, cardiac depression, hemorrhages, and a high mortality. In favorable cases it runs its course in 9 or 10 days and is followed by prolonged convalescence.

Cause.—Invasion and proliferation of *Bacillus pestis*. This bacillus belongs to that group which, while causing several different diseases, is characterized by the production of *septicæmia hæmorrhagica* in all. It is pleomorphic; stains with all the simple dyes, but not by Gram's method; in smear-preparations some bacilli (only) show bi-polar staining. Direct inspection of smear-preparations is a valuable aid to diagnosis, but in doubt critical differentiation of the suspected microbe is essential,



Bacillus of Bubonic Plague.—(*Yersin.*)

and can be made only by an experienced bacteriologist.

The germ gains entrance through the digestive and respiratory tracts, but especially through abrasions of the skin. Filth is a potent predisposing cause. The rat is a medium of transmission from house to house, while man in his travels is the agent of transmission through long distances. Flies, fleas, ants, and other insects may transmit the disease, while almost any of the lower animals are subject to it.

Clinical Varieties.—Three forms are distinguished by prominent clinical features: the *bubonic*. the *septicemic*, and the *pneumonic*. In milder bubonic cases the infection is confined to the lymphatic system; when fatal, however, this form always becomes septicemic, and the bacillus may be demonstrated in the blood-stream during the 24 hours preceding death. In the pneumonic form infection is, perhaps, by the lungs, to which the morbid process is usually limited. To these forms epithets have been applied. (a) "*Black*" has been used of those cases in which subcutaneous hemorrhages impart that color to the general surface. (b) "*Fulminant*" (*pestis siderans*) denotes those in which death occurs in from 1 or 2 to 24 hours after manifestation of the first signs of illness. (c) "*Ambulant*" is applied when the symptoms, though well marked, are so moderate that the patient is able to attend more or less efficiently to his business, or spends but a single day in bed; this distinction has value only in relation to the widely held opinion that the infection is diffused mainly by human intercourse. (d) The term "*pestis minor*" has been applied to two forms of illness. One is abortive (or larval) plague, which stands on all-fours with abortive smallpox; a transient feverishness and headache are attended with prickling or actual pain in a superficial lymphatic gland, which sometimes becomes swollen, and may even suppurate; reference to presence of a declared epidemic at the same time and place is necessary to support the diagnosis. The other consists in very slight fever, and swelling of an inguinal gland which cannot be referred to any definite cause; it may be met with "before, during, after, or in the absence of, epidemic plague" (Cantlie). There is thus no evidence that it originates in plague-infection; and as it has been described chiefly within the tropics, it has come to be called "*climatic bubo*."

Incubation.—There is no good evidence that the incubation period ever exceeds 5 days; it is very often limited to 3 days, or somewhat less.

Prodromes and Onset.—Prodromal symptoms are at most but rarely seen, and are but doubtfully distinguishable from the commencement of illness. In the great majority of cases the onset is sudden; often the patient can name to an hour the time at which he was attacked. Rarely it is gradual, and extends over 4 or 5 days of increasing illness, after which the patient suffers in one of the ways to be described below. Such symptoms cannot be described as prodromal; their lenity and gradual ingravescence are applicable by reference to the mode in which infection takes place.

Symptoms.—First, in every epidemic most cases are bubonic. Among colored races the proportion may be roughly estimated at 75 percent, the remainder being of the septicemic form, with a few only of the pneumonic; but among whites it is larger, cases of the septicemic form being fewer, and the pneumonic absent, or but 1 or 2 percent of the total. Second, the bubonic cases present every shade of severity, from the mildness of the ambulant variety upward. An average course is described:

1. The period of onset may be regarded as enduring about 12 hours; it resembles that of the acute infectious fevers in general. Feelings of chilliness or a rigor (in infants a convulsion), with frontal or vertical headache, are accompanied with nausea or vomiting, and sometimes by a slight diarrhea, and thirst. Discomfort or aching is felt in the limbs, and a severer pain in the loins or the lower abdomen. The face is flushed, the skin hot and dry; the temperature rises to 38.5° or 39° C. (101.3° to 102.5° F.); the pulse is full, of normal tension, and moderately quickened; respiration is quickened apart from lung-affections; the eyes are suffused; toward the end of the term there may be restlessness, and signs of mental confusion. Before, at, or shortly after an attack stiffness, pricking, or lancinating pain may be complained of in the groin, armpit, or neck; on palpation, tenderness is discovered; no tumefaction may be detected, or a single gland may be found very slightly enlarged, and in size from a pea to half a shelled almond.

2. A period of ingravescence ensues, during which the symptoms are developed in their totality; it may be regarded as lasting about 36 hours. The face is now pale; the expression apathetic, or dazed, or anxious, or terrified; hebetude is succeeded by restlessness, delirium with delusions, or mania; on being roused the patient collects himself with difficulty, and is sometimes angry at being disturbed; questions are intelligently though briefly and tardily answered; speech is frequently but not invariably blurred from incoordination of the muscles, and should the patient gain his legs, the latter is further manifested by staggering. There are sleeplessness, anorexia, and thirst; constipation is the rule; vomiting is continuous, the rejected matters being yellow, greenish, or bluish; except in the severest cases the urine is normal in amount, acid, sometimes offensive. The temperature rises to 41.5° or 42° C. (106.7° to 107.6° F.); the skin remains hot and dry; the pulse alters in character, and becomes rapid, small, easily compressible, and even in cases of moderate severity is often dicrotic. The tongue is swollen, moist, and characteristically furred; the dorsum carries a light creamy coating through which red papillæ show, while the tip and edges are clean and bright red; but during this stage it begins to become brown and dry. The gland which was first the seat of pain enlarges; other glands of the same group become slightly swollen; pain or tenderness becomes severer with the increasing tension, and the patient disposes his limbs so as to lessen pressure; swelling of other groups may begin, but is attended with much less pain.

3. From the third to the sixth or seventh day

may be distinguished as the period of state. The temperature usually falls to from 38.5° to 39° C. (101.3° to 102.5° F.), and thereafter, although rising with the occurrence of suppuration in the bubo, never attains the height it had previously reached. The patient presents an aspect of extreme prostration; decubitus is dorsal; the face is pallid or shallow, and pinched, sometimes singularly expressionless from relaxation of the muscles; the eyes are closed, or half open; the conjunctiva injected, especially at the palpebral angles. The tongue is dry, brown, and retracted; sordes appear; constipation continues, but severe diarrhea with tympanites sometimes supervenes and is likely to be followed by death; the urine is not diminished in quantity, but in about 75 percent of cases contains albumin in small quantity, hyaline casts, and renal epithelial cells, and is often slightly tinged with blood. A peculiar odor exhales from the body. Delirium gives place to stupor or coma; but at beginning of this stage, or in milder cases, restlessness attended with desire for change of place continues; all patients require constant watching, and often mild restraint. Cardiac depression becomes marked; the pulse is small, feeble, dicrotic, or running and uncountable. External hemorrhages appear: epistaxis, hematemesis, melena, hematuria, purpura. The bubo often attains a considerable size; it becomes involved in a doughy swelling, which mats together and obscures the whole group of glands; the skin over the large tumor becomes reddened. At any time during this stage a slight bronchitis may develop, and in a considerable proportion of cases scattered patches of pneumonia also occur. Death commonly happens between the fourth and the seventh days; occasionally the intellect remains clear to the end; most often stupor precedes death.

4. But if the patient survive, the period of decline is ushered in by a fall of temperature to normal or a little below it, usually by crisis, sometimes by lysis; whereupon the skin becomes moist and sleep returns; the pulse continues extremely feeble, and the least effort is liable to cause death by syncope. The bubo which occasionally disappears by resolution may usually be opened; but sometimes partial resolution is followed by late suppuration about the twelfth day; the temperature, which has risen again during suppuration, then falls, and remains normal.

5. During convalescence cardiac failure, aphasia, peripheral neuritis, paraplegia, hemiplegia, or facial paralysis may occur; gangrene of the skin may set in; interstitial keratitis and panophthalmitis sometimes lead to loss of sight in one or both eyes.

Septicemic Form.—The attack is violent; the temperature soon attains to 41° or 42° C. (106.7° to 107.6° F.); prostration is extreme from the beginning; early delirium rapidly gives place to coma; there are no buboes; hemorrhages commonly occur; diarrhea and tympanites are frequent. Death often happens within 24 hours, and life seldom extends beyond the fourth day; two-thirds or more of such cases in whites are fatal.

Pneumonic Plague.—In the preceding forms bronchopneumonia frequently occurs; the respiration is then much quickened; the expectoration is abundant, but little aerated, and streaked with blood; later it becomes tenacious, devoid of air, and rusty or mucopurulent. But this, which is due to local arrest and subsequent development of the bacillus, is an incident. Primary plague-pneumonia consists in a bronchopneumonia which is attended by moderate fever, a quickened pulse, only slightly quickened respiration, a slight cough with watery, serosanguinolent expectoration, which is not rusty but blood-stained (prune-juice); the characteristic of this form of plague being prostration and illness out of all proportion to the physical signs. It is almost always fatal, and endures about 5 days.

Postmortem Appearances.—Externally, vibices, petechiæ, or larger ecchymotic patches are commonly present; less often the remains of pustular or vesicular eruptions (contents sanious, scabs black), carbuncles, infiltrated areas of skin which may be sloughing, occasionally great edema of one limb from pressure on the great veins at the armpit or groin. In the commoner bubonic form a tumor of varying size exists at the angle of the jaw, lower in the neck, in the axilla, under the outer border of the pectoralis major, or in the groin. Internally, the blood is liquid, or ill coagulated, the serum hemoglobin-stained; normal shades of white and yellow are wanting, all the tissues presenting a dirty red tinge which strikes the eye. The primary external bubo is due to enlargement of one gland of the affected set to the size of a bean, or from that to a walnut, and of the rest of the group to a moderate extent. The former is in a state of intense, purple, inflammatory congestion, and is softened or broken down at several points; there is inflammatory congestion of the surrounding tissues; a blood-stained gelatinous effusion, which often penetrates even the subjacent muscles, mats the whole group into one edematous mass in which it is difficult to identify the glandular tissue by inspection; the other glands of the group are less swollen, and congested. All the lymphatic glands of the body are blood-full, rosy to purple on section; one member of some group other than that in which the primary bubo is seated (more rarely, of several groups) may be found rather more enlarged, and deeply congested; these latter are secondary buboes. In primary plague-pneumonia a bubo may be found in the lymphatic glands connected with the lungs. In all internal parts submucous and subserous hemorrhages are seen, from the size of a pin's head to several square inches in area.

The various visceral changes are: *Brain:* Inflammation of the meninges and meningo-encephalitis have been noted. *Lungs:* Hypostatic congestion, almost always; in addition, scattered foci of lobular pneumonia, distinguishable from other varieties only by the intense inflammatory reaction of the surrounding lung tissue; rarely a whole lobe is found solidified. Such patches result from localization of the bacillus; but occasionally the pneumonia is primary, and the manifestations of the disease are then confined to the respiratory system (primary plague-pneumonia). *Heart:* The pericardial fluid increased in quantity, sanguinolent; petechiæ of the visceral pericardum; myocardium pale and softened. *Kidneys:* There is always acute parenchymatous inflammation more or less advanced; hemorrhages in the adrenals. *Liver:* This organ is normal in volume; there is degeneration of the parenchyma and a nutmeg-section; on the upper surface whitish specks and small patches are seen, which indicate necrotic areas. *Spleen:* Enlarged, dark, soft, or diffluent; trabeculæ obscured; rarely it is normal in size and consistence. *Stomach and intestines:* These present petechiæ on both surfaces; internally, submucous edema, with a slight enlargement of the glands. The bacillus may be demonstrated at all centers of localization in all hemorrhages, and in the general circulation. It must be remembered that death not infrequently occurs early, as well as suddenly, from cardiac failure, when most of the above signs are wanting.

Diagnosis of the classic form is not difficult; during an epidemic a careful observer soon learns to recognize the sudden onset, peculiar aspect, early muscular prostration, state of tongue, and increasing depression of the circulation; which, if attended or followed by glandular pain and swelling, then often suffice to establish it. Nevertheless discrimination of plague from streptococcic septicemia is often difficult, especially when the point of entry is not apparent, or, if found, when lymphangitis is absent; and when absolute certainty is desirable (at beginning of epidemics, or in cases in which exposure to plague-infection is possible though not known, as at seaports), bacterioscopy can alone furnish the proof. A sterilized metal box, containing a tube of sloped nutrient agar, and an ordinary hypodermic syringe should be furnished from the hygienic laboratory. If the case be bubonic, the skin should be carefully cleansed with soap followed by alcohol; the swollen gland having been steadied and the skin over it rendered tense, the hypodermic needle should be carefully and steadily thrust into it; the piston is then to be slightly withdrawn half a dozen times, the needle also being partly withdrawn, and thrust into different parts of the gland. In this way sufficient liquid can usually be removed. The contents should then be carefully projected onto the agar surface, and both tube and needle (the latter not cleansed) carefully replaced in the box and transmitted to the laboratory, where the bacteriologist will make smears, cultures, and inoculations into animals. In primary pneumonia, diagnosis turns entirely on demonstration of the bacillus in the sputa, although the remarkable disproportion between the auscultation signs and the patient's evident danger may have aroused suspicion. In septicemic cases the blood may be examined; the bacillus is often discoverable in this form in the peripheral circulation about 24 hours after attack (a little earlier or later as the case may be).

Plague may be confused with malarial intermittent, relapsing, and typhus fevers, and with acute alcoholic poisoning. In *intermittent fever* the patient is likely to have dosed himself with quinin, when no hemamebæ will be found; however, the algid stage is much more intense and longer, while the hot stage is unattended by great prostration, and muscular strength and intelligence are preserved. In *relapsing fever* examination of the blood reveals *Spirillum Obermeieri;* the attack is sudden with vomiting, but there is less prostration; the face is injected, and expresses neither hebetude nor anxiety. During epidemics of plague attention is drawn to many cases in which glandular swellings are present, but unattended by important constitutional symptoms; and in a considerable proportion it will be found impossible to assign any definite cause to them. Some of them may, no doubt, be cases of *pestis minor* at a late stage; but there is a belief that this explanation should be very cautiously accepted; for attention is then arrested by cases which at other times would be treated with simple remedies without need appearing to investigate their exact cause. However, the banal causes—venereal or scrofulous disease, sepsis, and injury—should in every case be excluded as a matter of routine.

Prognosis.—This should always be very carefully guarded until the eighth day of illness has passed; patients are then unlikely to die of the fever; but the degenerated heart-muscle exposes them to great risk from syncope, which even the effort of rising from the supine to the erect sitting posture in bed may cause. At the commencement of illness it should be borne in mind that the mortality of plague among colored races is always between 80 and 90 percent, in whites it is usually about 33 percent, while primary plague-pneumonia is almost always fatal, as are about two-thirds of all septicemic cases in whites. A sudden fall of temperature to below normal, attended with coldness and dampness of the surface occurring during the period of state, betokens death (the internal temperature continues to rise); sharp diarrhea with or without tympanites, and external hemorrhages, unless in very small amount, are both of grave import. The situation of the primary bubo is important, a fatal issue more frequently attending on buboes in the neck than in the armpit, least frequently on those in the groin. Convalescence is always lengthy. Occasionally recovery from the effects of the acute morbid process fails, and death by exhaustion occurs many weeks later.

General treatment is symptomatic. Attempts may be made to encourage elimination by calomel and diuretics; fever may be reduced by cold or tepid sponging, although failing circulation may render application of heat to the feet necessary at the same time, but drugs, unless free from risk of depressing the heart, are hardly admissible for this purpose. To combat sleeplessness, ice to the head is valuable, but morphin, tetronal, trional, hyoscyamin, hyoscin, and the bromids may be employed, a combination of morphin and atropin, or of morphin and potassium bromid, being specially valuable. Against cardiac depression alcoholic stimulants, especially champagne, are most useful, but to them digitalis and strophanthus given by the mouth to strengthen contraction of the cardiac muscle, with digitalis and strychnin to counteract feebleness of the blood-vessels, must be added. It is said that the best results have followed subcutaneous injections of a combination of strophanthus and strychnin; of which latter, as well as of some other drugs, plague-patients are remarkably tolerant. As to buboes, early incision, leeches, and excision are harmful. Extract of belladonna may be applied to them, but ice gives most relief to pain. As soon as there is clear evidence of pus they should be opened by a free incision, such as will afford exit to sloughs; and antiseptics should be applied to the cavity. Phenol, in doses of 12 grains every 2 hours, diluted, has been used with marked success.

Specific treatment consists in the administration of subcutaneous and intravenous injections of Yersin serum; other serums are known, but this appears on the whole to have yielded so far the best (though still not satisfactory) results. Subcutaneous injection should be made in that area of skin the lymphatics of which converge to the primary bubo, and at a moderate distance below the latter. The quantity injected at one time may be from 40 c.c. to 80 c.c. or more. For intravenous injection a vein on the dorsum of the hand, or one at the bend of the elbow, should be selected; a ligature should be put on the limb so as to bring the vein into prominence; this should be further rendered tense by pressure of the thumb of the hand used to steady the limb, as in venesection; a hollow needle can then be plunged into it. Penetration of the vein is ascertained by beginning to inject before the ligature is removed; if it swells, the latter may be loosened and the injection completed. The quantity injected should not exceed 40 c.c. at any one time, but in severe cases this may (and should) be repeated after 5 or 6 hours. Intravenous administration is the more effectual. The serum causes a fall of temperature; the clinical guide to repetition is a rising temperature. Every case should receive a subcutaneous injection of 40 c.c. as soon as the clinical diagnosis has been made; but in severer cases 40 c.c. should at once be given intravenously, and at the same time another 40 c.c. subcutaneously. These massive doses, repeated at least twice in 24 hours, give the patient a chance of recovery, and seem, on the whole, to have sometimes succeeded; and as even smaller quantities are followed by reduction of temperature and improved arterial tension, the remedy, from which no ill effect need be apprehended, should be pushed. A sterilized diphtheria-antitoxin or other suitable syringe may be employed; the operation must be done with every asceptic precaution. All serums which have been stored present a slight deposit; this may be injected with the serum subcutaneously, but should be filtered out before introduction into a vein; and it need hardly be added that every care to avoid introducing air must be used in the latter case. Injections are liable to be followed by urticaria and joint-pains.

Specific preventive treatment consists in subcutaneous administration of 10 c.c. of Yersin serum, or of Haffkine's prophylactic in the dose for adults which is mentioned on each bottle, and which is usually 5 c.c. The former confers a passive immunity which is manifested immediately; the latter brings about active immunity which does not develop for about 8 days. Hence Yersin's serum should be used for protection of the members of a household among whom an indigenous case has appeared; their danger will cease either on removal from the premises or as soon as ordinary thorough cleansing and disinfection has been done. But Haffkine's prophylactic should be used for protection of individuals who are subject to prolonged intermittent exposure, by being obliged to visit the infected quarters of a city or to attend on the sick. The inoculation should be done at the back of the upper arm with aseptic precautions; it is not painful. It is followed in a few hours by slight malaise and headache, with feverishness; the ensuing night is often sleepless; the temperature has risen to 38.5° or 39° C. (101.3° to 102.5° F.) the next morning; after about 24 hours the puncture is found to be the seat of a small hard swelling, and there is a good deal of redness and diffuse swelling of the superficial tissues below it; the slight feverishness and malaise disappear in the course of the second 24 hours, having been, as a rule, not such as to interfere with usual engagements, and the redness and superficial swelling a little later; the hard swelling persists for about 3 weeks. Inoculation with prophylactic during the incubation-period does not aggravate the illness when it commences. Its general effects are to lessen liability to attack and to improve chances of recovery if attack should occur.

General Preventive Treatment.—*Bacillus pestis* is the cause of plague; it is found in the bodies of the sick, from which it may escape with excretions and secretions, with the pus of bubonic abscesses, and with discharges from those eruptions and skin-lesions which have the same specific origin. In the vast majority of cases it enters the body by inoculation through the skin: but in primary pneumonic cases it probably gains access through the respiratory muscous membrane. It can survive in viable and even in virulent form outside the human body; but this knowledge has been drawn from laboratory experiments the results of which, as M. J. Rosenau has judiciously observed, must not be applied to the varying conditions of daily life without reserves and cautions. As a matter of fact, the bacillus has been observed outside the human body only in the bodies of animals, among which rats and mice have most importance from their close association with man, and in the bodies of suctorial parasites, among which, again, fleas are of most importance. Then, it is now generally conceded that, as a matter of fact, the infection is very rarely conveyed from the sick suffering from the bubonic and septicemic forms to the healthy; only the pneumonic form is highly infectious, probably (as in tuberculosis) when the healthy inhale specks of saliva and expectoration projected in coughing. These appear to be the important facts touching diffusion of plague as it appears among a civilized population of whites, and from them the general precautions necessary in individual cases can be deduced. Importation to an average poor household (and *multo majore* to better placed households) of a case which has received the infection elsewhere appears to involve no risk to others even in absence of such precautions during the earlier days of illness as are usually taken with the commoner infectious fevers. It being clearly understood, however, that these latter are necessary in prudence, no more need be said on the subject of personal prophylaxis; nevertheless the central health authority (whose operations do not fall within the scope of this article) will properly insist on removal of every case of plague to hospital at the earliest moment, or else, when that is impossible, upon retaining the control of the home nursing-staff in his own hands. Acid sublimate solution 1:500 for mixing with excreta, etc., and the same 1:1000, together with 5 percent carbolic solutions for other purposes are as useful disinfectants as any. Proper sanitation should be established; the dead should be cremated, and all infected articles burned if possible. Rigid quarantine of persons, animals, and goods, should be enforced. Infection has not infrequently been conveyed by rats and cargoes; consequently the cargo of every suspicious ship should be fumigated and all rats aboard as well as on shore should be destroyed. The direct agent in conveying the infection from rats to man being the rat-flea, disinfection of clothing and kit of travelers should be insisted upon.

PLASMODIUM.—See MALARIAL FEVERS.

PLASTER (Emplastrum).—An adhesive, solid or semisolid, medicinal substance spread upon cloth or other flexible material, for application to the external part of the body. **Plasters are usually spread** on muslin, leather, paper, etc., and have as a basis, lead plaster, a gum-resin, or Burgundy pitch. **P., Antiseptic,** a plaster consisting of the ordinary adhesive plaster dipped in a hot solution of carbolic acid (1:60). **P., Black,** lead plaster. **P., Casts,** a model of an object produced by pouring plaster-of-Paris mixed with water into a mold of that object. **P., Court-,** a plaster prepared by dissolving 30 grams of isinglass in enough water to make 360 grams, and spreading the mixture thinly upon silk in two portions, one the watery solution, the other mixed with 120 grams of alcohol and 3 of glycerin. The reserve side of the silk is painted with tincture of benzoin. It adheres firmly to the skin when moistened. **P., Diachylon.** Synonym of P., Lead. **P., English.** Synonym of P., Court-. **P., Isinglass,** a substitute for adhesive plaster, used in superficial wounds. **P., Jacket,** a bandage surrounding the trunk, and made of plaster-of-Paris. It is used in caries of the vertebræ. **P., Logan's,** a plaster containing litharge, lead carbonate, Castile soap, butter, olive oil, and mastic. **P.-machine,** an apparatus used by pharmacists for spreading plasters. **P., Mahy's,** one containing lead carbonate, oilve oil, yellow wax, lead plaster, and Florentine orris. **P., Miraculous,** one containing red oxid of lead, olive oil, alum, and camphor. **P., Mull,** a plaster made by incorporating mull or thin muslin with a mixture of gutta-percha and some medicament dissolved in benzin. **P., Mustard,** one made by spreading powered mustard, or a mixture of mustard with flour or other powder, reduced to the consistency of paste by the addition of water, upon muslin. **P., Pitch,** a plaster containing Burgundy pitch, frankincense, resin, yellow wax, oil of nutmeg, and olive oil. **P., Rademacher's,** a plaster composed of red lead, olive oil, amber, camphor, and alum. **P., Resin,** a plaster composed of resin, lead plaster, and yellow wax or hard soap. See PLASTER (Adhesive). **P., Rubber,** a plaster in which the adhesive material is spread on thin muslin, and which sticks without being previously warmed. **P., Spice,** a plaster composed of yellow wax, suet, turpentine, oil of nutmeg, olibanum, benzoin, oil of peppermint, and oil of cloves. **P., Sticking-,** emplastrum resinæ. **P., Stomach.** See P., Spice. **P., Strengthening,** emplastrum ferri. **P., Surgeon's,** adhesive plaster. **P., Thapsia,** one containing yellow wax, Burgundy pitch, resin, terebinthina cocta, Venice turpentine, glycerin, and thapsia resin. **P., Vesicating,** cantharides plaster. **P., Vigo,** one containing lead plaster, yellow wax, resin, olibanum, ammoniac, bdellium, myrrh, saffron, mercury, turpentine, liquid storax, and oil of lavender. **P., Warm, P., Warming,** emplastrum picis cum cantharide.

There are seven official plasters:

TITLE.	CONSTITUENTS.
EMPLASTRUM:	
Adhæsivum. Adhesive plaster.	Rubber, 20 gm.; petrolatum, 20 gm.; lead plaster, 960 gm.
Belladonnæ. (Should not contain less than 0.38 percent, nor more than 0.42 percent of mydriatic alkaloids.) Belladonna plaster.	Extract of belladonna leaves, 300 gm.; adhesive plaster, 700 gm.
Capsici. Capsicum plaster.	Oleoresin of capsicum, 0.25 gm.; adhesive plaster, q. s.
Hydrargyri. Mercurial plaster.	Mercury, 30 gm.; oleate of mercury, 1 gm.; hydrous wool-fat, 10 gm.; lead plaster, 59 gm.
Opii. Opium plaster.	Extract of opium, 6 gm.; water, 8 c.c.; adhesive plaster, 90 gm.
Plumbi (Diachylon plaster.) Lead plaster.	Soap, 100 gm.; lead acetate, 60 gm.; water, sufficient quantity.
Saponis. Soap plaster.	Soap, 10 gm.; lead plaster, 90 gm.; water, sufficient quantity.

PLASTER, ADHESIVE.—The lead adhesive plaster was universally used before the introduction of the rubber adhesive plaster, and which, because it is less irritating to sensitive skins, is still preferred by some practitioners. It is made by adding to 80 parts of lead plaster 14 parts of resin and 6 parts of yellow wax. It is then spread on muslin prepared for the purpose. Adhesive plaster, while based upon the lead plaster, is rarely, if ever, used for the purposes of exhibiting the impression of oxid of lead.

To obtain the best results from adhesive plaster, the material must be freshly cut from a roll which has been kept in a tin box or other close-fitting receptacle. The plaster is best heated over an alcohol lamp or against the side of a vessel containing hot water (the smooth or nonadhesive side being placed in contact with the heated surface until the plaster is thoroughly softened), when it must be immediately applied to the skin. Placing a strip of adhesive plaster around a stove-pipe, with the adhesive side out, will often prove practicable in private practice. When strips are used, which, from their great length it is inconvenient to heat, the plaster surface may be softened by rubbing it over with a bit of raw cotton moistened with chloroform or ether.

Adhesive plaster may be worn for weeks at a time without producing cutaneous irritation. Hence it is to be preferred to rubber plaster for making extension for fracture of the thigh, or for affections of the hip-joint. Firmly applied over an ulcer and supported by a bandage, it forms a reliable method of dealing with leg ulcers due to varicose veins. Adhesive plaster is extensively employed in the treatment of fractured ribs and contusions of the chest. A number of strips about 2 inches wide are applied parallel to the ribs, beginning at the lowest and passing up to the axilla. Each strip is to be applied with firm traction, and extend from the vertebral column to a point a little beyond the median line in front. Marked relief is afforded by this procedure. In fracture of the clavicle in children a dressing of adhesive plaster will be found a satisfatory means of keeping the ends of the bone in position. Sayre's dressing for fractured clavicle is made of adhesive plaster. Sprains are often strapped with adhesive plaster.

PLASTER-OF-PARIS.—Gypsum or calcium sulphate is used for making stiff or immovable bandages and dressings, and for the preparation of casts. An ordinary creolin or loose-web bandage is well rubbed with fine plaster-of-Paris. The bandage is then applied to the part wet, additional plaster is rubbed in, and the cast thus formed is allowed to dry or "set."

The method of testing the quality of plaster-of-Paris is by taking a small pinch of the powder between the thumb and finger and gently rubbing it; if small particles of grit are felt, it indicates that parts of the plaster have already absorbed water, and it is therefore unfit for use. The same test may be observed by taking a pinch of the powder again and placing the fingers under water, and then rubbing in the same way as before. If, however, in both of these tests no grit is felt, and, under water, a thin, creamy substance is formed which is easily rubbed off the fingers, the plaster is in a proper condition for use. When plaster has been kept for a long time, or when it is gritty, its condition can be very greatly improved. It may be redried by putting it in a metal dish, such as a pie-plate or iron pot, and placing it in an oven of a hot stove or over a gas-jet. As soon as it becomes heated, it will be observed that a process identical with boiling water is taking place. When this ebullition has entirely ceased, the powder is freshly kiln-dried. If the method of testing is again resorted to, it will be found that the gritty appearance and feeling will have disappeared in a very large measure, leaving only the now dry powder ready for use. If there are any lumps remaining, they may be removed by the use of a sieve. Plaster-of-Paris must always be kept in a hermetically sealed jar, or in a very dry place.

To Remove a Plaster Dressing.—In order to facilitate the removal of plaster-of-Paris dressing from limbs, the following plan should be followed: After application of the usual thin layer of absorbent cotton around the limb, parchment paper, which has been previously moistened, is wet and applied. Over this, in the direction that the dressing is to be sawed open, a good sized string which has been well rubbed with vaselin is laid on and the dressing then applied. The ends of the string are then tied together over the bandage. When in the course of time the plaster dressing is to be laid off, the ends of the cord are untied, one tied to the end of a sufficiently long steel wire, which has been closely nicked, is drawn through the channel filled by the oiled string, and after each end of the wire has been attached to the handles of a chain saw, it is drawn to and fro until the plaster has been sawed through. Then the dressing is easily removed.

PLASTIC SURGERY.—Plastic surgery is that branch of the operative art by which congenital or acquired defects and deformities are repaired. With the extension of surgery, plastic operations have been extended from the skin, to which they were long limited, to the various mucosæ, to bone, to tendon, and to nerve. The present article will be limited to its considerations as applied to the skin alone.

The rationale of all plastic surgery is based on the inherent vitality of tissues after they have been removed from their original site and implanted in a new position, whence they thereafter obtain nutrition. In dermatoplastic operations two chief methods are to be considered:

Gliding Pedicle, or Flap.—Those procedures in which the skin to be utilized for filling a gap retains, for a time at least, some connection with its original site.

Skin-grafting Proper.—In this method of plastic surgery the integument utilized may be taken from the body of the patient himself. For this the term autoplasty is used. Heteroplasty is reserved for the utilization of tissues from a person other than the patient, or from an animal.

For the relief of many defects—as, for example, of the lip, the eyelid, or a part of the nose—the first method is still the only one applicable. The area of the defect is first to be freshened by clean incisions extending through the entire thickness of the skin. All scar tissues must be removed. By doing this the defect will be seemingly greatly increased. The margins and floor of the wound should be made as smooth as possible, and all bleeding checked before proceeding to shape the skin structures which are to cover the gap. In fashioning the skin to be transferred, one of two plans may be followed: (1) That of gliding, and (2) that of making a flap to be nourished by a pedicle.

The gliding method of closing a defect by traction on the vivified edges of the skin surrounding it, is based on the extent to which skin can be stretched and yet retain its vitality. Oval or triangular defects, or such as can be converted into either shape, are best suited for a gliding operation. To facilitate the gliding of the skin destined to cover the gap it is undermined for a varying distance. This is a safe method; it leaves no new defect and the broad attachment of the skin assures its viability even under considerable tension from traction. When the form and size of a defect preclude its closure by traction alone, the skin in the immediate vicinity may be dissected up in a patch of requisite size and by a process of gliding be brought edgewise into the position of the part to be repaired, when, after proper adjustment, it is retained by sutures. Triangular or rectangular defects, such as follow partial removal of the lip or of the eyelid, can best be repaired in this way.

When the gliding method is impracticable, **flap formation** must be resorted to. The defect is vivified, as in the gliding operation. The flap is taken from the most available part. Usually it is taken from near the defect. It may, however, be taken from a distance, as in rhinoplastic operations, where the skin flap is taken from the arm. To cover large defects of the extremities, as after burns of the elbow or wrist, the integument may be taken from the abdomen or side of the chest. Mr. Croft's operation, in which this is done, is of greatest value in the conditions named. In this procedure a flap of skin 6 or 8 inches long, and 2 or 3 inches wide, is raised from the underlying tissues of the abdomen and retained by bridges of skin above and below. For a week or 10 days the under surface is allowed to granulate. Now only is the lower attachment of the flap severed and brought into the freshened gap—as, for example, of the elbow or wrist—and sutured there. Until firm union has resulted, the arm is firmly bandaged to the side of the body. After another 10 days, the upper bridge is severed, and the flap finally placed in its new position.

Viability of the flap is the first requisite of success. It should be fashioned to insure a sufficient blood supply. It should contain the entire thickness of the skin and a part of the underlying subcutaneous layer. Bleeding flaps are viable. From the natural contractility of the skin, flaps shrink considerably. They should, therefore, be cut one-third larger than the defect to be filled. In formal plastic operations the pedicle should measure not less than 1 inch in width. Excessive torsion of the pedicle must, for obvious reasons, be avoided. The fixation of the flap by sutures forms the final step of the plastic operation. Accuracy of apposition is essential. The absence of blood within the wound and strict aseptic and antiseptic precautions tend to assure success. In plastic operations about the face the buried subcuticular suture is particularly to be advocated. The after-treatment is simple. A dry gauze dressing, held in position by bandage or strips of adhesive plaster, will go far toward supporting the parts and assuring primary union.

Skin-grafting.—In 1869 **Reverdin** first published a method of rapidly causing the closure of superficial wounds and ulcerated surfaces by implanting in them small grafts of epidermis that had been entirely removed from the body. The grafts were the size of a pin's head, and deposited in little depressions made with a knife in the surface to be covered. From these grafts the epidermis developed in minute islands, which, as they grew, coalesced, and eventually covered the entire surface. The method of Reverdin was often uncertain and slow in achieving a result. For this reason it failed of general adoption, and was entirely superseded by that of **Thiersch**, advanced in 1886. This is based on the viability of strips of the superficial layers of the skin when entirely removed from their original sources of nutrition, and their tendency to form permanent attachment to denuded surfaces. Wolfe, in 1868, and after him a number of ophthalmic surgeons, transplanted large portions of the skin from the arm in plastic operations on the eyelids.

Among the conditions in which skin-grafting by large films is indicated may be mentioned: (1) Indolent ulcers, as of the leg, or those following burns. (2) Fleshy denuded areas resulting from the removal of neoplasm, as after the excision of superficial epitheliomata or lupus patches from the face. Immediate closure of the wound can thereby be accomplished. (3) After excision of extensive growths, as for mammary cancer, when the wound cannot be closed by traction suture without dangerous tension. (4) Areas of the bone that have recently lost their covering of soft parts, and can be covered in no other way. Areas of bone exposed after necrotomy operations. Skin-grafts unite readily to aseptic bone surfaces.

Operation.—The locality where the skin is to be grafted must be a flesh wound, or, in the case of an ulcer, it must be so converted by removing all granulations by the use of the sharp spoon. All hemorrhage must be checked by hot salt solutions and compression. The presence of blood under the graft would, more than all else, endanger the success of the procedure. Unevenness in the floor of the defect does not militate against the adherence of the grafts.

The epidermal strips are usually taken from the anterior surface of the thigh or from the outer surface of the arm. This part should be sterilized, as for ordinary operations, some time before the strips are cut. When everything is ready for cutting the strips, the skin is made tense by the left hand of the operator or by an assistant. A constant flow of salt solution likewise is directed against the field of operation. With a sharp, broad razor, preferably plane on one surface, the surgeon cuts strips of the epidermis and papillary layer of the skin. The cutting is done parallel to the surface, and by a to-and-fro or sawing movement. The strips are cut of requisite length and width, and may be made an inch or more wide, and 5 or 6 inches long. Each strip is at once transferred to its new habitat and placed in position with raw surfaces in opposition. The edges of the graft have a marked tendency to curl in a manner that would bring the epidermis underneath. This can easily be corrected by gently using a probe and mouse-tooth forceps. As many strips as may be needed are cut and placed in position. The edges should be made to slightly overlap. When there has been no bleeding under the grafts, adhesion takes place rapidly, probably as a result of atmospheric pressure.

Dressings after skin-grafting should be aseptic, not antiseptic. Solutions of corrosive sublimate are harmful. The dressing may be that of rubber protective or silver-foil or oiled silk moistened with salt solution. An excellent dressing is gutta-percha tissue in that it can be readily sterilized by formaldehyd fumes, is pliable and free from odor, and is not disintegrated by body temperature and moisture. The gutta-percha tissue cut in narrow strips is applied directly to the newly grafted surface. Over this the ordinary gauze and cotton dressing are retained by a bandage. The gauze dressing is removed daily and sterile normal saline solution is applied with a camel's-hair brush to clear away any exudate that appears between the strips.

In exceptional cases the entire thickness of the skin is utilized for the graft (**Wolfe's method**). A flap of the desired size and form is outlined by an incision to the fascia. The edge of the skin is raised with mouse-tooth forceps, and the flap removed from the subcutaneous layer by long and even strokes of the knife. Fat lobules are to be carefully removed from the flap before it is placed in its new position.

As a rule, the skin is very pale and continues so for a number of days after transplantation. Sutures are, as a rule, unnecessary, if not harmful. The after-treatment is the same as for the epidermal graft. With many operators, gold-beaters' skin or silver foil is made to take the place of the moist rubber protective dressing.

PLETHORA.—Abnormal fulness of blood or superabundance of blood. Serous plethora is an excess of serum in the blood. The best drug for affections of plethoric subjects is aconite, and it is decidedly the best remedy for apoplexy in the plethoric. When there is a determination of blood to the head, arsenic may be used to advantage, while sulphur is to be used as a mild purgative for plethora from cessation of the menses. For abdominal plethora, saline and hydragog cathartics are of service. The purgative saline waters, such as Vichy or Saratoga, are also valuable. Grape-juice has helped many cases. Dry diet is indicated in dyspepsia and hepatic enlargement from excessive beer-drinking. Avoid much bread, salted or twice-cooked meats, rich sauces, solid vegetables, especially soups, cucumbers, and fruits. Biscuits, fresh meats, lemons, fish, fowl, and game may be used.

VENESECTION (*q. v.*) is sometimes employed.

℞. Resin of podophyllin,	gr. vj
Compound extract of colocynth,	gr. xij
Alcoholic extract of belladonna leaves,	gr. iij.

Divide into 12 pills. Give 1 pill every night.

PLEURA, INJURIES.—Rupture of the costal pleura probably occurs spontaneously in every case of fractured rib or severe contusion of the thorax, but, owing to the skin being unbroken, the injury is repaired at once, with only a transient or local pleurisy at the most; and though such complications as hematothorax from rupture of an intercostal or internal mammary artery and pneumatocele may occur, they are very rare. When there is an external wound, the pleura only may be injured, without the lung, if the weapon is blunt and enters the thorax slowly, so that it pushes the lung in front of it, or if the wound is in the tenth or eleventh interspace; for though the pleura usually extends as low as the last rib, the lung, unless it is emphysematous, only reaches the tenth. In this case, however, the diaphragm and the subjacent viscera are very likely to suffer. Other complications depend upon the size and extent of the wound. If it is merely a puncture or a small incision, the diagnosis is often never made; but if it is extensive, the lung may protrude without injury through the opening (*hernia*); it may collapse and fall back, leaving the pleura full of air (*pneumothorax*); the cavity, as already mentioned, may be partly filled with blood, and the air may either pass in and out freely through the wound (*traumatopnea*), or it may be forced into the cellular tissue under the skin, and spead over a considerable area (*emphysema*). This, however, is seldom extensive unless the lung is wounded. Finally, at a later period, pleurisy may set in, and even run on to empyema. See CHEST (Injuries), LUNG (Injuries), PLEURISY.

PLEURISY.—Inflammation of the pleura.

Varieties.—According to cause, it may be divided into primary or secondary; according to extent, into unilateral, bilateral, or local; according to time, into acute or chronic; and according to the exudation, into serofibrinous, fibrinous, or purulent.

Etiology.—(1) It may be idiopathic from exposure to the cold and wet; (2) traumatism; (3) it is usually associated with lobar pneumonia and pericarditis; (4) it is secondary to certain infective and toxemic conditions, such as acute rheumatism, pyemia, typhoid fever, gout, nephritis, and tuberculosis (common); (5) cancerous (rare).

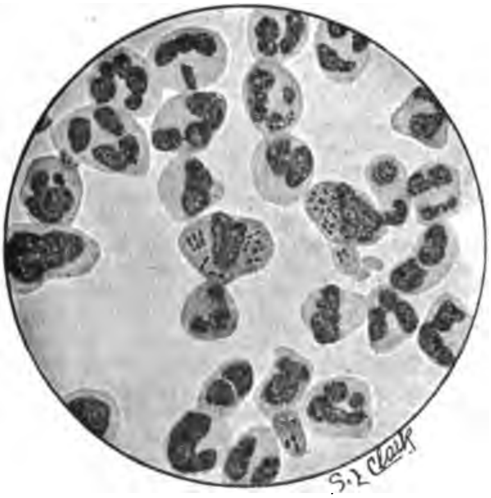
The exciting cause is said to be infection by pneumococci, staphylococci, or streptococci.

Pathology.—Pleurisy consists of three stages: (1) Stage of congestion; (2) stage of effusion; (3) stage of organization or absorption. In the early stage, to the naked eye the pleura is red, swollen, and covered with flakes or curds of yellowish or whitish lymph (dry pleurisy). The process may stop in this stage, or the effusion may accumulate in large quantities in the pleural sac (serofibrinous). It may be only covered with a film of deposit mostly fibrinous (fibrinous), or it may become infected, giving rise to purulent pleurisy (empyema).

Serofibrinous Pleurisy.—The amount of fluid varies greatly from half an ounce to several pints. As the liquid accumulates in the stage of effusion, it gravitates toward the lower portion of the pleural sac, compressing the lung upward and backward.

The diaphragm is displaced downward and the heart toward the opposite side of the lung affected. The fluid may be absorbed, may be organized into new tissue, or may become purulent.

Fibrinous Pleurisy.—In this form the deposit is scanty, thick, whitish or yellowish in color, and generally circumscribed. A considerable amount of cellular infiltration may occur, giving rise to the formation of new tissue and causing the two surfaces of the pleura to be bound together (adhesive pleurisy). If the process is a progressive one, the lymphatics may become involved, spreading to the lung and causing bronchopneumonia.



CELLS FROM EXUDATE, CASE OF EMPYEMA.—(*Coplin*). The large hyaline cells (macrophagocytes) contain many pneumococci.

Purulent pleurisy (empyema) generally results by metastasis during the course of pneumonia or tuberculosis. An empyema, however, may be primary or may become purulent by infection during the course of a serofibrinous pleurisy. The septic process may cause erosion of the visceral layer, thus extending to the lung and finally the bronchi, when the purulent collection may be discharged during the act of coughing. If the rupture takes place in the parietal layer, the pus burrows its way externally, producing an abscess in one or more of the intercostal spaces, generally near the sternum. In young patients this process generally causes great deformity of the chest after the pus has been evacuated. See COLON BACILLUS INFECTION.

Hemorrhagic Pleurisy.—Effusion of blood in the pleural sac, resulting from cancer, tuberculosis, scurvy, and grave forms of anemia.

Symptoms and Clinical Course. Acute Pleurisy.—The onset is generally marked by chilly sensations, slight cough, the act of which gives rise to a sharp pain (stitch) in the affected side. The temperature is somewhat elevated (100° to 102° F.), pulse full and only moderately increased in rate, and frequently not corresponding to the height of fever. The respirations are increased, often being painful, especially on taking deep inspirations. The cough is distressing, generally being cut short by the sharp pain in the side. The sputum is occasionally tinged with blood; in certain cases the sputum may be profuse, while in others it may be suppressed. As the disease progresses, dyspnea becomes apparent, and the patient lies on the affected side to relieve the intense pain set up during the course of the disease. As the fluid accumulates, this symptom gradually abates, the fever becomes lower, while the respirations still remain embarrassed.

Physical Signs. Stage of Congestion.—There are diminished expansion and, perhaps, decreased tactile fremitus over the affected area. On auscultation a to-and-fro grazing, creaking, or crackling friction sound is heard. The crackling sound is often mistaken for crepitant or subcrepitant râles. If due to râles, the sound is generally removed by coughing, while in the former instance the sound is not modified.

Stage of Effusion.—There is diminished expansion over affected area, often bulging of intercostal spaces and displacement of apex-beat to the right or left, according to pleura affected. Palpation confirms inspection; diminished vocal (tactile) fremitus. Percussion elicits movable dulness. If the upper level is at the third intercostal space when the patient is in sitting posture, it will be at fourth interspace or lower when lying down. The line of dulness is usually curved, being higher posteriorly. Above the line of dulness a zone is found which yields a hyperresonant (tympanitic) note, or Skoda's resonance. On auscultation the respiratory murmur is weak, the expiratory breath-sound frequently being inaudible in the stage of effusion. Earlier in the disease bronchial breathing is present, most marked along the spine and interscapular region. A friction sound may be detected above the level of the fluid anteriorly in some cases. Vocal resonance is diminished in the stage of effusion, but when bronchial breathing is present in cases of moderate effusion, bronchophony may be heard. The unaffected lung is doing vicarious work, and both inspiration and expiration are harsh in quality on that side which also yields a hyperresonant note. When there is a small amount of fluid present, egophony is elicited, most marked near the angle of scapula of the affected side. Mensuration shows increase in anteroposterior diameter on affected side. Aspiration detects the presence and character of fluid, whether serofibrinous or purulent. The white blood-corpuscles, red cells, and hemoglobin remain about normal.

The Stage of Absorption.—There is gradual return to the normal physical signs. Occasionally friction redux is detected.

Physical Signs of Chronic Fibrinous Pleurisy.—Chronic pleurisy may result from the acute form, the fluid not being absorbed, and therefore yields the same physical signs as in acute form. In dry or plastic pleurisy (chronic) on inspection the chest is greatly deformed on affected side. Palpation yields diminished vocal (tactile) fremitus. On percussion there is impaired resonance. Auscultation detects pleuritic grazing or creaking friction sounds, and diminished vocal resonance. The respiratory murmur is diminished in intensity.

Symptoms of Purulent Pleurisy (Empyema).—There are hectic symptoms, sweats, chills, high irregular fever, dyspnea, expectoration of very offensive material, edema and redness in the intercostal spaces, and on aspiration the purulent fluid is obtained.

Diagnosis depends upon the subjective and objective symptoms.

ACUTE PLEURISY.	LOBAR PNEUMONIA.	INTERCOSTAL NEURALGIA.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*
1. Onset marked by chilly sensations, sharp cough.	1. Onset marked by shaking chill, cough, dyspnea.	1. Onset marked by stitch in side, pain along intercostal spaces.
2. Cough often checked by darting pain in side.	2. Cough gives rise to pain in throat and general chest pains.	2. Cough absent.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*
1. Fever slight (100°) and very irregular.	1. High fever (104°) with diurnal variation.	1. Fever absent.
2. Slight dyspnea (20 to 30 respirations a minute). Patient lies on affected side.	2. Dyspnea great (40 to 50 respirations a minute). Patient uncomfortable in all positions.	2. Respiration normal. Patient lies on affected side.
3. *Inspection.* — Diminished expansion of affected area and bulging of interspaces; heart displaced.	3. Physical signs observed in pleurisy are different.	3. Diminished expansion during inspiration.
4. *Palpation.* — Diminished tactile (vocal) fremitus.	4. Increased vocal fremitus.	4. Normal vocal fremitus.
5. *Percussion.*—Percussion-note dull over effusion, movable dulness, Skoda's resonance from effusion.	5. Percussion-note dull.	5. Percussion-note normal.
6. *Auscultation.*—Respiratory murmur diminished, egophony at angle of scapula, grazing or crackling pleuritic friction sound.	6. Bronchial breathing, crepitant râle on inspiration, increased vocal resonance (bronchophony).	6. Respiratory murmur normal.
7. *Mensuration.*—Affected side increased in diameter.	7. Diameter both sides of chest equal.	7. Diameter of chest equal.
8. Sputum may contain streaks of blood (uncommon).	8. Sputum contains blood ("rusty colored") and diplococci.	8. Sputum normal.
9. Aspiration detects fluid.	9. No fluid withdrawn on aspiration, as a rule.	9. No fluid on aspiration.

Prognosis.—For acute pleurisy in adults the prognosis is favorable. In children great deformity of chest may ensue. In purulent pleurisy the prognosis should be guardedly favorable if the fluid is removed early. In tubercular pleurisy the prognosis is unfavorable.

Treatment demands absolute rest in bed and a light diet, such as sweet milk, soup, beef-juice, soft-boiled eggs, rice, bread and butter. The chest may be enveloped in flannel or a light cotton jacket.

Pain is relieved by hypodermic injections of morphin (1/4 grain) with atropin (1/125 grain), and by strapping chest with adhesive plaster. If the pulse is strong and bounding, the tincture of veratrum viride (20 minims) or the tincture of aconite (10 minims) may be given every 3 hours until 5 or 6 doses have been taken. Late in the disease, when the effusion is great, these drugs are dangerous on account of the profound depression induced by their action. In the early stages blisters add to the distress of the patient; late in the disease a series of small blisters do good. As in ascites, catharsis may have some influence in diminishing the amount of fluid in the pleural cavity. Of the different remedies, possibly magnesium sulphate (4 drams) is the best. It should be given before breakfast. Compound jalap powder (20 to 40 grains) every 4 hours may be taken instead of the salts. Three bowel movements a day are sufficient. If the fluid shows no signs of absorption before the second or third week of the onset of disease, one of two methods remains to be chosen: First, to get rid of the effusion by means of blisters and cathartics; second, to aspirate. Each method has its advocates.

Removal of Effusion by Blisters and Cathartics.—As has been mentioned, possibly magnesium sulphate (4 drams), preferably taken before breakfast, is the most reliable drug. At the time of administration of the purgative it is best to restrict the amount of water and liquid food to the minimum. A series of small blisters (1/2 by 2 inches) may be induced by cantharidal plaster over the affected region; when signs of healing are noticed, a new site may be selected for the blisters. The daily application of the tincture of iodin may be substituted for the blisters. The administration of potassium iodid (6 grains 3 times a day) is also recommended.

Removal of the Fluid by Aspiration.—Aspiration is always indicated in the following conditions: (1) When the level of fluid extends above the third rib; (2) when the dyspnea is intense; (3) when it remains unabsorbed from 2 to 3 weeks of onset, or after subsidence of the fever; (4) when the disease is bilateral and the total amount of fluid present is equal to the volume of one pleural sac; (5) when the fluid is purulent (empyema). Resection offers the most hope to the patient in the last instance.

The patient should take the sitting posture. The point for introduction of aspirating needle is either at the outer angle of scapula in eighth interspace, or near the posterior axillary line in the seventh interspace. Either point may first be rendered as aseptic as possible, and after anesthetizing the part by means of a few drops of a solution of cocain (5 percent), the needle is introduced with a quick thrust into the pleural sac and the cannula withdrawn. If the fluid does not at once drain away, it may be due to the needle being plugged with fibrin—inserted too far or not far enough. It is not a good plan to rotate the needle in different directions for fear of lacerating the parts. If the quantity of fluid is excessive, about two-thirds should be drawn off, and the remainder allowed to remain for 2 or 3 days. During the latter part of the process the patient frequently feels faint, and a small quantity of whisky should be at hand to combat the exhaustion.

Thoracoplasty, or **Estlander's operation,** consists in removing a portion of several of the ribs, for the purpose of allowing the chest-walls to fall in, in cases of empyema where, after the pleura has been drained, the lung, in consequence of adhesions, does not expand. An incision 3 or 4 inches in length may be made obliquely downward and inward over the side of the chest, just in front of the latissimus dorsi, across the ribs the portions of which it is intended to excise. The edges of the wound being retracted to expose the ribs, an incision is next made through the periosteum along the course of each rib for the required distance, the periosteum separated with a raspatory from both the outer and inner surface, and the rib then cut through with the saw or bone-forceps at each end of the incision, the soft parts being protected by a spatula passed beneath the rib.

Autoserotherapy.—The withdrawal of a syringeful of the exudate and hypodermic injection of it immediately is apparently efficacious, especially in acute cases. Repeated injections may be necessary in severe cases.

Vaccine and open-air treatment has recently been used with success, the vaccine administered being autogenous.

PLUMBUM.—See LEAD.

PNEUMATIC CABINET.—See PNEUMOTHERAPY, under TUBERCULOSIS, Pulmonary; LUNGS (Surgery).

PNEUMOGASTRIC NERVE, DISEASES.—Anatomy.—The pneumogastric nerve arises from the oblongata, between the origins of the glossopharyngeal and spinal accessory nerves. It passes through the jugular foramen, and is joined by branches of the spinal accessory. Giving off small branches, it passes down the neck behind and in the same sheath with the carotid artery, enters the thorax on the right side over the subclavian artery, and on the left between the subclavian and the carotid arteries. It passes through the thorax, beside the esophagus, and ends in branches to the stomach, spleen, and intestines. The most important branches are the pharyngeal, the superior laryngeal, the recurrent laryngeal, which passes back—the left around the arch of the aorta, the right around the subclavian artery. Branches pass to the esophagus and pulmonary branches to the lung and to the cardiac plexus for the heart. The nerve may be affected at its nucleus of origin, in its trunk, or in the terminal branches.

Etiology.—The nucleus most frequently is affected with bulbar paralysis, while tumors or aneurysms compress it within the skull, or it may be involved in meningeal thickening, whether syphilitic or otherwise. In the neck it may be compressed by aneurysm or glandular tumors, and is most liable, especially in the recurrent branch, to be ligated or wounded. When wounded it is necessary to remember that its fibers are composed of accelerator and depressor motor fibers for respiration, depressor fibers for the heart, motor and sensory fibers for the esophagus, and some sensory and motor fibers for the stomach.

Symptoms.—When the pharyngeal branches are affected, there is difficulty in swallowing, as they supply the constrictors of the pharynx and the levator palati muscle. When the laryngeal branches are affected, the voice usually becomes hoarse; coughing is impossible, and the glottis cannot be closed. Paralysis of the muscles of one side of the larynx is a prominent symptom when the trunk of the vagus in the neck or the recurrent is affected. In locomotor ataxia bilateral paralysis occurs, when the spinal accessory nuclei are affected—as is also the case in diphtheria and in bulbar paralysis. Bilateral spasm is often produced reflexly. In epilepsy the cry is produced by a tonic contraction of the vocal cords, and is part of the cortical discharge occurring locally. The "laryngeal crises" of locomotor ataxia are due to local irritation of the spinal accessory nucleus.

Spasm of the pharynx is paroxysmal in character, and is almost always part of functional nervous diseases. It forms part of the spasm of hydrophobia, and occurs in hysteria. In emotional states, as in fear and intense grief, swallowing may be impossible from such spasm.

Spasm of the laryngeal muscles is manifested in the adductors. When the recurrent branch is affected, direct spasm usually affects only one vocal cord.

Treatment.—The general treatment of diseases of the pneumogastric nerve depends upon the different causal conditions. Central disease is, as a rule, beyond the range of treatment. Potassium iodid will often remove suspected causes of pressure. In laryngeal paralysis electricity, locally applied, is often of benefit. Strychnin injections are also sometimes useful. In spasmodic affections, sedative inhalations, especially of chloroform, are useful, and applications of cocain will diminish afferent impressions of the larynx. Bromids and morphin lessen the irritability of the nerve-centers.

PNEUMONIA, CATARRHAL.—See BRONCHO-PNEUMONIA.

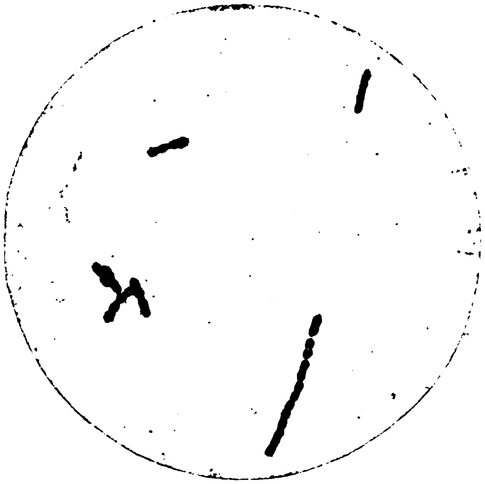
PNEUMONIA, CROUPOUS (Lobar Pneumonia; Fibrinous Pneumonia; Acute Pneumonia; Pneumonitis).

Definition.—Pneumonia is an acute specific disease, due to infection with the diplococcus pneumoniæ (pneumococcus of Fraenkel) and, rarely, with other microorganisms, characterized by a fibrinous exudation into the pulmonary air-cells and bronchioles, and following a course that is more or less typical, the chief symptoms being those of toxemia and of interference with the respiratory and circulatory functions. Streptococcus-pneumonia is regarded as a more or less distinct form of pneumonia.

Etiology.—The greatest predisposition to pneumiona is in early adult life; it is less common as a primary disease before 20 and after 50 years. Women are nearly four times more liable to it than men, and it is more prevalent among the negroes in America than among the whites. There are more cases in the winter and early spring, and fewest from June to December, and it is relatively more rife in the Southern than in the New England States. Surgical operations, ether narcosis, and previous attacks are also predisposing causes.

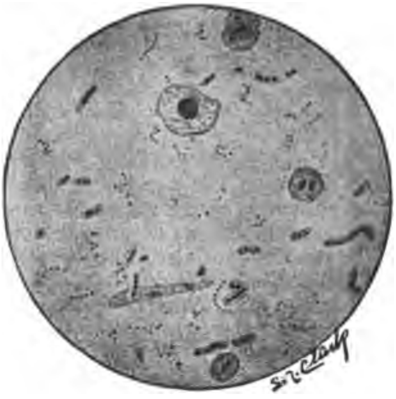
As a secondary disease it is associated with epidemic influenza, typhus and enteric fever, variola and other exanthems, diphtheria, erysipelas, puerperal septicemia, acute dysentery, whooping-cough, tuberculosis, acute and chronic nephritis, diabetes, malaria, gout, and chronic alcoholism. Emphysema, asthma, and chronic valvular heart-disease are said to confer a certain immunity.

Bacteriology.—It is now believed that the essential cause of pneumonia is a microorganism, and that the disease is a specific one. Although prolonged exposure to cold and sudden chilling are followed by attacks, yet if the accepted theory of pneumonia is true, such incidents prepare the tissue of the bronchioles and alveoli for infection, but do not in themselves cause the disease. The same may be said of contusions, fracture of the ribs, and other traumatic causes which are sometimes followed by pneumonia. The diplococcus of pneumonia is found in health in the mouth and upper air-passages, but infection does not take place unless some other influences, such as those mentioned, are brought into play. The microorganisms usually gain access to the alveoli through the bronchial tubes, but they may reach the lung through the circulation; this is shown by the presence of the pneumococcus in the exudate of meningitis, pericarditis, endocarditis, and in other lesions complicating fibrinous pneumonia, and by its occasional discovery in the blood.



PNEUMOCOCCUS OF FRAENKEL IN SPUTUM OF PNEUMONIA, GRAM'S STAIN AND EOSIN.—(*Williams.*)

The specific microorganism most frequently found in typical fibrinous pneumonia is the diplococcus pneumoniæ (the pneumococcus of Fraenkel). There are cases presenting the characteristic symptoms and physical signs in which other bacteria have been found, as Pfeiffer's influenza bacillus, the streptococcus pyogenes, the staphylococcus aureus, and the typhoid bacillus. In view of these facts and of the failure of Fraenkel's parasite to produce pneumonia in animals by inoculation, it cannot be asserted that there is one specific cause of pneumonia. (See, too, COLON BACILLUS INFECTION.)



SPUTUM, CROUPOUS PNEUMONIA.—(*Coplin.*)
In the extreme upper part of field is a leukocyte showing chromatolysis but containing englobulated cocci. Below and slightly to the left of this cell is a squamous cell from the mouth. To the right of the latter and slightly below is a polymorphonuclear leukocyte, and in the extreme lower part of the field is a small hyaline cell. The field also contains numerous encapsulated pneumococci a few streptococci and unarranged cocci that cannot be identified with accuracy.

Pathologic Anatomy.—The general distribution of lesions in pneumonia proves that it is a general disease. The lung presents the most serious changes, but the blood, serous membranes, kidneys, and spleen show decided alterations.

Lungs.—It is usually stated that the lower lobe of the right lung is involved in three-fourths, and alone affected in one-half, of all the cases. Pye-Smith's figures give a different conclusion from this. Out of his 434 cases, the right base was the seat of disease in 140, the left base in 151, the right apex in 60, and the left apex in 20 cases. There were 8 cases of central and 55 of double pneumonia. Apical pneumonia is much less common than pneumonia of the base. Double pneumonia occurs in about one-sixth of the cases; it may involve both bases, or the apex of one and the base of the other lung. The inflammation spreads upward from the base and downward from the apex, and the tendency of the disease is to implicate the whole lobe or the entire lung.

The changes through which the lung passes are conveniently divided into three stages: (1) Congestion or engorgement; (2) consolidation or hepatization; (3) resolution.

1. **Stage of Congestion and Serous Exudation.**—The affected lung in this stage is congested, more resistant to touch, has somewhat increased weight and density, and is darker in color. On section a bloody liquid exudes, the tissue is brighter red than normal, and there is less crepitation on pressure. Toward the end of this stage the color is darker red, the density is greater, and there is even less crepitation, but pieces of the affected part

still float in water. From the resemblance of the lung to splenic tissue, this condition is called splenification. The increased density and changed color are found, microscopically, to be due to overdistention of the blood-vessels of the alveolar septa, and to the exudation of serum with the escape of leukocytes and a few red blood-cells into the alveoli and bronchioles.

2. **Stage of Fibrinous Exudation and Solidification (Hepatization).**—In this stage, beginning on the second or third day, the lung is increased in bulk and 3 or 4 times in weight; it is inelastic and liver-like in density and appearance (red hepatization). The cut surface is dark red or brownish-red, dry, and granular; crepitation is absent, and pieces sink in water. The tissue is friable and breaks down under rough handling.

The corresponding pleura, both parietal and costal, is covered with a layer of thick, soft lymph. At this period the alveoli and smallest bronchi are completely filled with a fibrinous exudate, seen with the microscope as a network of thread-like lines, with entangled leukocytes, red blood-cells, exfoliated alveolar epithelium, and diplococci or other microorganisms. It is this exudate which is the essential and characteristic feature of fibrinous pneumonia; by filling and then coagulating within the alveoli and minute bronchi, it renders the lung airless and solid. Later in this stage, the exudate compresses the alveolar capillaries and makes the tissue bloodless. Thus, "gray hepatization" is brought about, the lung remaining solid, but the color changing to grayish or yellowish-gray. Thrombi fill up the branches of the pulmonary artery as far back as the large vessels, but the nutritive vessels are pervious.

3. **Resolution.**—Between the fifth and eighth days, usually, the exudate begins to soften, and the entangled cells, among which are many leukocytes, undergo fatty degeneration. Liquefaction is followed by absorption, and, when the latter is completed, the alveoli are open and the lung is restored to a normal condition. In this process the lung becomes gradually softer, less resistant, and finally elastic. The whole of the affected lobe is not going through these stages at the same time: while the first part attacked is becoming consolidated, neighboring areas are in the state of congestion. The sudden crisis of the third stage, however, puts an immediate end to all processes. The nonpneumonic portions of the lung and the opposite lung may be congested and edematous; the bronchi are congested or in a catarrhal state, and the bronchial lymph-glands are congested, soft, and swollen.

In drunkards and cachectic individuals the exudate is hemorrhagic, and does not solidify, so that the stage of complete consolidation is not reached. In cases that have been prolonged, pressure on a cut surface leaves a pit that fills up with a purulent fluid; this condition, supposed to be a perverted and delayed resolution, has been called "purulent infiltration." In the terminal stage resolution sometimes does not occur, and by the breaking down of the septa an abscess cavity is formed; this empties into a bronchus, or is encapsulated. Gangrene of the lung is a very rare termination, as is also a fibrous alteration called fibrous pneumonia or carnification. An abundant serous effusion may take place into the pleura (pleuropneumonia), and not infrequently, especially after influenza pneumonia, empyema is a final stage.

Next in importance to pulmonary lesions are those of the **heart**, for it is upon the relative integrity of this organ that the fate of the patient most frequently depends. The right heart, as a rule, contains red or white clots that extend into the branches of the pulmonary artery; the left cavities may be empty. The heart-muscles may undergo parenchymatous degeneration. Pericarditis, especially in left-sided pneumonia, and endocarditis are not unusual. This last has the malignant form, and is rapidly fatal. In both lesions, as well as in all exudates, the pneumococcus has been found.

In the **kidney** the cells of the tubules show cloudy swelling or granular degeneration, and in a few cases there is acute nephritis.

The **liver** is congested, and the **spleen** large and soft.

The **nervous system** shows few changes, meningitis being the most common.

Symptoms.—Primary fibrinous pneumonia is always a serious disease, and has a necessary intensity, conforming more or less in uncomplicated cases to a definite type. Every variation from this type is unfavorable, whether in the direction of greater or less intensity, or in the loss of essential characteristics. A prodromal period of 2 or 3 days is noted sometimes, with nasal or pharyngeal catarrh, epistaxis, or loss of appetite and diarrhea.

First Stage.—The onset is sudden, with a chill, lasting a half-hour or longer; it is most common and most severe in young adults, but is absent in the aged and in children. After the chill the patient has flushed cheeks, a hot and dry skin, and a rapidly rising temperature; he complains of a sharp stitch in the region of the nipple, in the midaxillary line, or just anterior to the angle of the scapula; inspiration increases the pain, and an involuntary effort is made to relieve it by making the respirations shallow and irregular. A short and sharp cough is accompanied by a viscid sputum in small masses without air-bubbles, and of a peculiar, yellowish-red or "rusty" color. It consists of mucus, blood discs, leukocytes, and minute casts of the bronchioles. In stained preparations the diplococci or other microorganisms are seen.

Some importance as a symptom is to be given to a group of herpetic vesicles on the upper or lower lip, chin, or cheek. The tongue is coated; the urine is scanty, high colored and acid, depositing lithates on cooling, with more lessening of urea, chlorids, phosphates, and sulphates than in other febrile disorders. Headache, a sense of illness and prostration, insomnia, and slight delirium may be present from the beginning. Early in the attack the number of leukocytes in the blood is increased from the normal 8000 or 10,000 to 20,000 and 30,000, or even to 60000.

They grow in number up to the crisis, and then quickly drop to the normal proportion. These are the symptoms of the stage of congestion and last about 2 days.

The physical signs during this period are diminished expansion, with normal vocal fremitus; the percussion-note is less clear, passing into dulness as consolidation begins; the respiratory murmur is feeble or suppressed; moist or dry râles may be found, and later there is bronchovesicular breathing. Crepitation, the only pathognomonic physical sign, may or may not be heard on inspiration. A pleural friction sound is rarely present.

Second Stage.—No well-defined line separates the symptoms of the second stage from those of the first, but by the second or third day an aggravation of all the symptoms has developed. The patient wears a more anxious expression, one or both cheeks have a dark, sometimes livid red color, the nostrils expand with inspiration, and the lips are often dark red, and in some cases purple. The temperature at the close of the first or second day reaches 104° F. to 105° F., and remains at about this maximum with diurnal variations. The pulse is 110 to 120, its tension and fulness lessening with the progress of the disease and growing feeble and intermittent.

The cough is less frequent than at first, and may, by the third or fourth day, cease altogether. The same is true of the sputum as well as of the local pain; both disappear when the lung is consolidated. The dyspnea, on the contrary, increases; the respirations are shallow, and are 30 to 40 or more to the minute, being relatively more frequent than the pulse. The tongue has a thick white fur, and there is constipation. In some cases jaundice occurs.

The nervous symptoms are very variable, but are often the most striking clinical features. Headache and general aching may disappear with the onset of delirium, which is maniacal or of the low muttering character; the active form occurs in drunkards and in cases of apical pneumonia; the typhoidal form may be present from the beginning or toward the end of the first week, and is accompanied by tremor of the limbs and tongue. In some instances there is mild delirium at night only, the mind being clear during the day, but at all times there is an absence of natural sleep.

The intense toxemia, in addition to the asphyxia and disturbance of the heart and circulation, bring about a very rapid change in the patient's appearance. The flushed cheeks, dilating nostrils, rapid breathing, and restless movements indicate the serious nature of the illness, and the changes for the worse, from day to day, are very decided.

The physical signs of the second stage are: The affected side expands less, and vocal fremitus, unless there is pleural effusion, is exaggerated. There is percussion dulness, with increased resistance over the solid lung, whether base or apex, and this extends upward or downward. Bronchial breathing and bronchophony are heard first over the locality of beginning consolidation, whence they spread over the whole of the pneumonic area.

Third Stage.—The beginning of resolution is a true crisis, and is shown in the sudden drop of the temperature and in the change in all the symptoms. It comes between the fifth and ninth day, being sometimes preceded by pseudocrisis; a normal or subnormal point is reached in from 5 to 15 hours, and is followed by a natural sleep, free sweating, and relief from suffering. The patient then enters upon convalescence.

On *physical examination* a subcrepitant râle (râle redux) is heard in the midst of the bronchial breathing, and the signs of consolidation gradually disappear with multiplying moist râles. Percussion dulness may last for some time, owing to the pleuritic exudate. By the twelfth or fourteenth day the lung has returned to its normal state.

Death may occur in 36 or 48 hours, or it may come in the last days of the first or beginning of the second week. Muscular and nervous exhaustion, with increasing feebleness of the pulse, delirium and coma, burning dry heat of the skin, cold extremities, and cyanosis are symptoms preceding death. It may be due to intense infection affecting the nerve-centers and the heart, to hyperpyrexia, or asphyxia due to loss of respiratory surface, or to some complication.

Variations.—Temporary hyperpyrexia during the first 4 days is not uncommon; in about one-fourth of the cases a temperature of 105° F. or over is maintained for 2 or 3 days, and in fatal cases this may be continued to the end. In children vomiting or a convulsion takes the place of a chill; nervous symptoms predominate, and the physical signs are slow in developing. As a rule, there are no localized pain, cough, or expectoration. In the aged the onset is insidious, the fever is less, cough and sputum may be absent, and the physical signs appear slowly. In alcoholics cerebral symptoms and fever may be the only indications to be relied on, the physical signs alone giving sure evidence of the disease. In the cachexias or in enfeebled constitutions consolidation of the lung is not complete; there is great prostration, with prune-juice expectoration.

Instead of resolution occurring on or about the ninth day, the progress may be delayed by the continuance of fever of irregular course and by persisting moist rales. It is under these circumstances that the lung is believed to be in the condition of "purulent infiltration." Delayed resolution and the continuance of the physical signs of consolidation with fever may end after some weeks in the sudden discharge from the lungs, through the bronchial tube, of a large quantity of pus—the so-called abscess of the lung. A much graver termination is gangrene of the lung, which is brought about by the closure of a nutrient vessel supplying the pneumonic area; this condition is shown by fetor of the breath, an offensive thin sputum, great prostration, and sometimes by the physical signs of a cavity.

The symptoms differ more or less from this description when pneumonia develops during the progress of, or at the end of, the various acute or chronic diseases enumerated under the head of etiology. It is then frequently the closing event, and the picture is modified by the peculiar symptoms in each case. The anatomic condition of the lung and the physical signs are the same, however, as in the primary form. In secondary pneumonia the chill is usually absent and the temperature range is less constant, and, in many cases, not so high as in primary pneumonia. Cough, sputum, and localized pain may also be absent. The breathing is always much embarrassed and the serious nature of the illness is shown in the rapid decline of strength.

Complications.—In the respiratory organs the complications of pneumonia are laryngitis, general bronchitis, collateral hyperemia, and edema of the opposite lung. The fibrinous pleurisy that is a necessary part of pneumonia may be attended by the effusion of serum (pleuropneumonia) and empyema in from 1 to 5 percent of all cases, and may develop after the pneumonic symptoms have subsided. Pericarditis has been noted in 2 to 8 percent of cases, and endocarditis was present in 16 out of Osler's 100 cases, but in only 7 of Pye-Smith's 425 cases. The daily examination of heart would probably disclose a large proportion of cardiac lesions. Symptoms in pericarditis have not the same value as physical signs; endocarditis has, however, the characteristic and rapidly progressive asthenia of the malignant form. Meningitis occurs in intense general infection, and is associated not infrequently with malignant endocarditis; the symptoms are cerebral—active delirium passing into the low muttering form with coma. Other and rarer complications are acute nephritis, catarrhal, membranous, or ulcerative colitis, icterus, arthritis, otitis media, parotitis, thrombosis of the femoral vein, and peripheral neuritis.

Diagnosis.—Pneumonia developing in a previously healthy adult is recognized by the sudden chill, the high temperature, side pain, rusty or bloody sputum, and by physical signs that point to the lung as the seat of attack. Stained specimens of the sputum reveal the diplococcus in most cases. The subsequent course of fever, with the consolidation of the lung, the nervous and other symptoms, make a picture that is not easily mistaken. If any doubt exists, the critical change, at a more or less fixed date, clears up all uncertainty. Blood examination is of great value, as a leukocytosis of from 20,000 to 30,000, and ranging as high as 60,000, is invariably found; it varies with the seriousness of the attack, and continues up to the crisis. In secondary pneumonia the features are so modified by the primary disease that the diagnosis is often difficult. Physical signs have the most value, and the daily examination of the thorax will often explain the nature of symptoms that bear but little likeness to those of pneumonia. In drunkards, children, and old persons, fever alone, or associated with cerebral disturbance, may be the only symptom of a pneumonia that would escape detection if the lungs were not examined.

Pleurisy is distinguished from pneumonia by the lessened movement of the chest, the absence of fremitus, and by egophony. The symptoms, too, are less acute, and the characteristic sputum is wanting. If pleurisy with effusion complicates pneumonia, a judicious interpretation of the united symptoms and physical signs makes the diagnosis not a difficult one. In cases of great uncertainty an aspirator can be used without any danger.

Bronchopneumonia or **catarrhal pneumonia** is more common than fibrinous pneumonia in infancy and in advanced life, and as a sequence to pertussis and measles. It is preceded by the symptoms and physical signs of bronchial catarrh, the consolidation is in both lungs, although not always at the same time; the sputum is mucopurulent, and contains no pneumococci, but streptococci and staphylococci; the temperature is lower and more irregular than in lobar pneumonia, and the symptoms are without any definite duration, lasting longer, as a rule, than in fibrinous pneumonia and coming to an end gradually without crisis.

In **hypostatic congestion** with edema, cough, frothy, bloody expectoration, and dyspnea are present, but there is no chill and little or no fever. Slight dulness on percussion and subcrepitant râles are found on both sides.

Apical pneumonia and **tuberculosis** are sometimes confounded; both have local pain, cough, bloody expectoration, and fever; the physical signs of consolidation are the same, although advancing at a different rate and running a different course. But the fever in pneumonia is continued, and in tuberculosis is remittent or intermittent; bacilli in the sputum, and the absence of leukocytosis also favor the existence of tuberculosis. After 2 weeks have passed there can no longer be any question if the local signs and the symptoms continue unchanged. **Cancer** of the lung, a rare condition, resembles pneumonia up to a certain point, but the onset is gradual, without chill or much fever, and there are constant pain and rapid emaciation. In **appendicitis** pain and rigidity may be reflected through the lower intercostal nerves and simulate lobar pneumonia.

Croupous Pneumonia.	Pleurisy.	Typhoid Fever.	Acute Phthisis.
Subjective Symptoms.	*Subjective Symptoms.*	*Subjective Symptoms.*	*Subjective Symptoms.*
1. Onset sudden, with severe chill.	1. Onset sudden, with chill or chilly sensations.	1. Gradual onset, with vague pains, epistaxis, diarrhea, and eruption.	1. Onset sudden, with severe chill; history of phthisis in family.
2. Pain in affected side not so great as in pleurisy.	2. Sharp pain (stitch) in affected side.	2. Pain on pressure in right iliac region; tenderness about spleen.	2. Same as pneumonia.
3. Cough which increases pain in affected side.	3. Severe cough often cut short by "stitch" in side.	3. Slight cough.	3. Same as pneumonia.
4. Delirium after first two days.	4. Delirium uncommon.	4. Delirium frequent.	4. Same as pneumonia.

CROUPOUS PNEUMONIA.	PLEURISY.	TYPHOID FEVER.	ACUTE PHTHISIS.
Objective Symptoms.	*Objective Symptoms.*	*Objective Symptoms.*	*Objective Symptoms.*
1. High fever 104°, and very regular.	1. Moderate irregular fever.	1. Moderate fever and regular.	1. High irregular fever, frequently varying several degrees.
2. Pulse full, bounding; rate moderately increased.	2. Pulse full; rate slightly increased.	2. Pulse dicrotic; rate gradually increased.	2. Pulse rapid and feeble.
3. *Inspection.*—Diminished expansion.	3. Same as pneumonia.	3. Expansion normal.	3. Same as pneumonia.
4. *Palpation.*—Increased vocal (tactile) fremitus.	4. Diminished vocal fremitus.	4. Fremitus normal.	4. Same as pneumonia.
5. *Percussion.*—Note in first stage hyperresonant; subsequent dulness at base of lung.	5. Percussion-note dull.	5 Percussion-note normal.	5. First stage same as pneumonia; later dulness at apex of lung.
6. *Auscultation.*—Bronchial breathing; crepitant râle; bronchophony, occasionally pectoriloquy.	6. Respiratory murmur almost inaudible; pectoriloquy.	6. Sonorous and sibilant râles are common.	6. Bronchial breathing; mucous small râles; later gurgling râles.
7. *Mensuration.*—Normal on each side.	7. Increase in anteroposterior diameter on affected side.	7 Normal.....	7. Normal or decreased diameter.
8. Sputum "rusty color," containing diplococci.	8. Sputum whitish, frequently streaked with blood.	8. Sputum normal.	8. Sputum often contains blood and tubercle bacilli.

Prognosis.—The fatality of primary fibrinous pneumonia varies from 15 to 25 percent. Among young, healthy men composing armies, it is much less; in 40,000 cases in the German army the death-rate was 3.6 percent. In children under 5 years it is not above 3.3 percent; after 50 years it reaches 50 percent and upward. This difference is due to the lessened resistance of the aged, and especially to senile degenerations in the heart, kidneys, and other organs. In hospitals the mortality is higher than in private practice, in the proportion of 26.1 (Osler) to 12 percent. Previous conditions of ill health and the drinking habit are the chief causes of this difference; the latter has a most fatal influence in pneumonia. More deaths occur in the autumn and winter than in the spring and summer. In individual cases the danger lies in the toxemia and in the mechanic interference with respiration and circulation. Pneumonia of one lobe is much less serious than of the whole lung, and this is less so than double pneumonia, which has a death-rate of 50 percent and upward.

Unfavorable symptoms are a temperature above 105° F., increasing frequency and weakness of the pulse, feeble heart-sounds, prune-juice sputum, early delirium of the maniacal or the low muttering form, muscular tremor, profuse sweating (except at the crisis), excessive tympanites and hiccup, cold extremities, and cyanosis and abundant bronchial and tracheal râles.

A slight leukocytosis, below 14,000, or a very high leukocytosis with a low temperature, are discouraging indications. Complications of the heart, kidneys, and meninges of the brain add greatly to the danger.

Secondary pneumonia has no fixed death-rate, the result depending upon the nature of the previous or coexisting illness; but in all cases the mortality is higher than when pneumonia begins in previously healthy persons.

Treatment.—Experiments on animals and the inoculation of cases of pneumonia with the blood-serum of immunized rabbits and of convalescents from pneumonia have given much hope that ultimately an antipneumotoxin may be found. An abortive or distinctly curative treatment cannot be employed generally until a successful antitoxin is as readily obtainable as the antitoxin of diphtheria. In the meantime pneumonia must be recognized and treated as an acute, infective disease, tending to self-limitation, the chief dangers of which are, first, toxemia, with the resulting high fever and exhaustion of the heart and nervous system; and, secondly, the lessened air-space and obstruction to circulation through the right heart and pulmonary vessels.

Fresh air is of vast importance. The patient should be placed in a well-ventilated room, with an open fire and open window; the temperature of the room should be kept below 70° F.—65° F. being the minimum. In no disease is a trained nurse more needed, and strict sick-room discipline should be maintained from the beginning. The strength should be husbanded by the use of the bed-pan, and by not permitting the patient to sit up for food or for examinations of the chest. Milk is the best food—3 to 4 ounces every 3 hours, so as to amount to 2 or 3 pints in the 24 hours. Tympanites and undigested casein in the stools call for a less quantity and for dilution of the milk with barley or Vichy water. If there is a distaste for milk, koumiss, matzoon, or farinaceous gruels may be given as substitutes. The disease is of short duration, and but little food can be digested and assimilated; fever, prostration, and dyspnea will be increased by excessive feeding. The craving for liquids must be gratified by the free use of cold water, or by any of the effervescent waters.

The eliminative treatment is important. Perspiration should be promoted and a purgative may be prescribed at the start—calomel is the best, followed by a saline. No other drug, as a rule, is needed in the first stage, and in many cases none will be called for throughout the entire illness. A. H. Smith believes in the efficacy of "an attack upon the pneumococcus through the medium of the blood, the object being that the exudate, when it escapes into the air-cell, shall be impregnated with a substance that will unfit it to serve as a culture medium." To effect this may be given calomel, 20 to 30 grains in one dose; chloroform or creosote (creosotal preferably) by the mouth or by inhalation; quinin, or a salicylate. Creosotal is given in 10 minim doses in capsule or emulsion every 4 hours. Sodium salicylate or aspirin is to be preferred, 60 to 120 grains in 24 hours, after the plan of Robert Liegel.

It is claimed for the external applications of cold water that, as in typhoid fever, they not only reduce temperature, but eliminate the toxins, and thus strengthen the heart and relieve the nervous symptoms. For adults this can best be done by applying to the front and back of the entire chest a compress made after the pattern of the oil-silk jacket, wrung out of water at 60° to 70° F., and covered with flannel. This is reapplied every half-hour or hour, according to the height of the temperature and the effect produced; it should be discontinued when 99.5° F. has been reached.

Mays uses large, flat, rubber ice-bags—2 to the head and 2 or more to the chest. He claims a mortality of 4.25 in 400 collected cases treated with ice applications. It must be taken into account, however, that a number of these cases were in children.

The cold tub-bath is objectionable, because it fatigues and excites the patient. Tepid or warm baths are preferable. In some cases the warm or cold wet-pack, with an ice-bag to the head, has a most happy effect, especially in the onset of pneumonia in children, with cerebral excitement and high temperature. The patient may be left in the pack from one-half an hour to an hour. Cold sponging may take the place of the compress or pack if a less decided effect is desired.

In serious cases hypodermoclysis is efficacious, 1/2 to 1 pint of normal hot salt solution (0.6 percent) being injected daily or oftener.

Insomnia is inevitable, and a too vigorous effort should not be made to relieve it. It is best treated by hydrotherapy, but if there is no sleep in 24 hours, alcohol, sodium bromid, chloralamid (10 to 20 grains), or hyoscin hydrobromid (1/100 grain) hypodermically, may be given at night. Morphin, however, is most to be relied on for this purpose, given hypodermically in doses of 1/32 to 1/16 grain, and repeated in 1 to 2 hours, the dose to be increased on subsequent nights if found to be too small. In cases of feeble heart it can be combined with strychnin or other cardiac stimulants. Dover's powder has no advantage over morphin.

The treatment of delirium is covered by the foregoing suggestions. In alcoholic cases it is necessary to give stimulants according to the degree of habitual use.

The heart and pulse must be sustained from the beginning. Alcohol and strychnin, 1/60 to 1/20 grain, repeated every 3 to 6 hours, are the best remedies for this purpose. Atropin, caffein, strong coffee, or strophanthus may be used as aids or substitutes. Nitroglycerin has a special influence and value in cases of weak heart, with venous congestion of the organs; the rule as to dosage should be to give enough of it to produce a desired effect and to sustain this effect as long as necessary.

Digitalis has been by turns condemned and praised. Theoretically, there are objections to its use; it increases arterial tension and does not relieve the pulmonary stasis, but it has the property of neutralizing the pneumococcus toxin, and has been given with good effect in large doses by Petresco, of Bucharest, and by Maragliano. The former gave 60 to 90 grains of the dried leaf daily. Maragliano gave 60 grains in infusion on the first day, repeated in lessening doses as the pulse becomes slower. But little support has, as yet, been given to this heroic procedure.

For the relief of dyspnea and cyanosis, oxygen inhalations are usually employed. Their effect, however, is rarely what theoretic considerations would lead one to look for. In the severe cases in which such effect is most needed, the improvement in the character of the pulse, in the breathing and color of the lips, is temporary and not definite and complete. Still, it should always be used in such cases in conjunction with cardiac stimulants.

Secondary pneumonia, as a rule, needs early alcoholic stimulants and a treatment modified by the preceding disease. In influenza pneumonia great irregularity and weakness of the heart are a greater danger than the condition of the lung, and call sometimes for strychnin and nitroglycerin in large doses until improvement is assured. In the pneumonia of typhus and typhoid fever and other secondary forms, hydrotherapy is much less efficient than in primary cases. Each complication must be met, when possible, by treatment. Paracentesis may be needed in pericarditis and in pleurisy; and in empyema, section of the rib and drainage should be done as early as the diagnosis is made.

A word should be said about bleeding in pneumonia. As a rule of treatment, it received its death-blow from J. Hughes Bennett, and has not been since advised except as a resort in exceptional cases. In young, vigorous, and plethoric adults, with hyperpyrexia and a pulse of high tension, it may be beneficial in the first 48 hours. A small bleeding of 6 or 8 ounces has been advised in later stages, when there is cyanosis from overdistention of the right heart. The advocacy of venesection is only half-hearted, and its use is hedged about with so many restrictions that the rule of never bleeding, under any circumstances, is a safer one to follow. To restore faith in bleeding, even as a resort in exceptional cases, severe therapeutic trials are needed to prove the value of the favorable. but limited, individual support of this lost art. Instead of bleeding veratrum viride is highly praised by some.

The "*open air treatment*" is beneficial. The patient must be well wrapped up and protected, and then allowed all the fresh air that is available. See SERUM THERAPY, AND VACCINE THERAPY.

PNEUMONOKONIOSIS.—A general term indicating chronic disease of the lungs due to the inhalation of dust. Various names have been devised denoting the kind of dust causing the inflammation; *anthracosis* or coal-miner's disease; *siderosis*, due to inhalation of iron dust; *chalicosis*, due to inhalation of mineral dust as of lead in lead miners' phthisis; *lithosis* or *silicosis*, stone-grinders' or potters' phthisis, due to inhalation of particles of silica. Steel-grinders' phthisis is probably due to the particles of grindstone that are inhaled. Ganister disease is due to the dust of a siliceous rock. The dust particles, when they can no longer be disposed of by the natural protective agencies of the lungs, find their way into the peribronchial and periarterial lymph-spaces, where they set up an inflammation. This is characterized by a marked tendency to fibroid change, manifesting itself in the formation of hard, indurated nodules of various size. The fibroid areas may soften and break down, forming the so-called ulcers of the lung. Tuberculosis is prone to develop for the pulmonary lesions form a favorable nidus for the tubercle bacillus.

PNEUMOTHERAPY.—See TUBERCULOSIS (Pulmonary).

PNEUMOTHORAX.—Air in the pleural sac.

Etiology.—(1) Perforation of the pleura adjacent to a phthisical cavity; (2) perforation of the diaphragm from malignant disease of the stomach or esophagus; (3) rupture of the lung by overstraining; (4) rupture of empyema into the lung; (5) traumatism.

Pathology.—There is effusion of air into the pleural sac. Coexisting with pneumothorax there is frequently an effusion of fluid into lung tissue—pneumohydrothorax, or pneumopyothorax, if purulent. The disease is usually unilateral, and may cause great displacement of the heart. The lungs are usually smaller than normal, due to the compression.

Symptoms and Clinical Course.—Sudden pain, dyspnea, cyanosis, or collapse (subnormal temperature, rapid pulse, and cold extremities) may mark the onset of the disease. When slight, no special symptoms are produced in many cases. If pleurisy is present, the characteristic stitch in the side is pronounced.

Physical Signs. Inspection.—There is bulging of the intercostal spaces, usually limited to one side, and displacement of apex-beat.

Palpation shows diminished vocal (tactile) fremitus.

Percussion-note is tympanitic over affected area, while immediately below this area dulness is elicited on account of presence of fluid. On turning patient to opposite side, the fluid gravitates and dulness may be replaced by tympany.

Auscultation shows an absence of the respiratory murmur and normal vocal resonance. If due to rupture of phthisical sac, amphoric breathing is heard. At times metallic tinkling is detected. This is due to the dropping of fluid from above downward in an inclosed sac.

Succussion detects splashing sound.

Bell tympany is frequently present. It is elicited by placing the flat surface of a coin on the bare chest over affected area, and on being struck by another similar coin while listening over opposite side of chest in same relative position, a clear metallic sound is heard.

Diagnosis.—Pneumothorax may be mistaken for a diaphragmatic hernia, but the stomach-tube would indicate the displacement. In dilated stomach the tympanitic note is continued downward to umbilicus, as well as upward.

A large phthisical cavity simulates pneumothorax closely, and in many cases is identical with it. Usually phthisical cavities do not produce bulging of the intercostal spaces, are circumscribed, and the dulness is not movable.

Prognosis is unfavorable.

Treatment is symptomatic. If collapse threatens, strap the chest by means of adhesive plaster, and give hypodermics of whisky, strychnin (1/4 grain), and atropin (1/125 grain). Keep up bodily temperature by application of hot-water bag or hot blankets to extremities.

PODAGRA.—See GOUT.

PODODYNIA.—Pain in the foot, and especially in the sole of the foot; the word is now usually limited to painful heel—a neuralgic condition about the heel, attended with little or no swelling, no discoloration, and no affection of the joints. The pains are very severe, though often limited to a very small area. It may be associated with rheumatism or gout, and with certain occupations requiring much standing.

PODOPHYLLUM (May-apple).—The root of mandrake, *P. peltatum*. Its active principle is a *resin* which is official and contains two isomeric glucosids, *podophyllotoxin* and *picropodophyllin;* also podophyllinic acid and protocatechuic acid. Podophyllum probably contains the alkaloid *berberin*, which is found also in berberis, hydrastis and other plants. It is a tonic astringent, cholagogue, and purgative, and is likely to produce nausea. It is recommended in remittent fever, bilious vomiting, and malarial jaundice. Dose of the root, 5 to 20 grains; of the resin, 1/8 to 1 grain. **P., Fluidextract.** Dose, 2 to 20 minims.

Pilulæ Podophylli, Belladonnæ et Capsici, have in each pill 1/4 grain of the resin, with 1/8 grain extract of belladonna and 1/2 grain capsicum. Dose, 1 to 2 pills.

For constipation:

℞. Resin of podophyllin, Powdered aloes,	each, gr. iij to vj
Extract of nux vomica, Extract of belladonna,	each, gr. iv.

Make 24 pills. One pill night and morning.

POIKILOCYTOSIS.—See BLOOD.

POISONING.—According to Reese, a poison is a substance capable of producing noxious and even fatal effects upon the system, no matter by what avenue it is introduced; and this, as an ordinary result in a healthy state of the body, and not by a mechanic action.

Witthaus defines a *poison*, as "a substance which being in solution in, or acting chemically upon, the blood may cause death or serious bodily harm;" and a *corrosive*, as "a substance capable of causing death or injury by its chemical action upon a tissue with which it comes in direct contact."

The **most energetic poisons** are hydrocyanic acid, potassium cyanid, nicotin, strychnin, phenol, and some reptile venoms. The poisons usually selected by poisoners for criminal purposes on others are those which produce effects resembling the symptoms of natural disease, as arsenic, colchicin, tartar emetic, strychnin, morphin and aconite. Those generally chosen for suicidal purposes are such as may be most readily obtained by the laity, namely—phenol, morphin, illuminating gas, charcoal gas and potassium cyanid, the first being easily purchased for disinfecting purposes, while the last is commonly used in the arts.

Diagnosis.—If diagnosis cannot be made from direct history, the process of exclusion should be instituted.

The following lists have been compiled by Murrell, but no attempt has been made to render them complete, and they must be taken as being merely suggestive:

The Patient is Dead.—Prussic acid (death in a few minutes at the outside); cyanid of potassium (usually kills very quickly); strong ammonia (may kill in a few minutes); carbonic acid gas (if pure, may kill almost at once); carbonic oxid; oxalic acid. Almost any active poison if given in a very large dose.

The Patient is Comatose.—Opium; morphin; alcohol; chloral; chloroform; camphor.

The Patient is in a Condition of Collapse.—Strong acids; alkalies; aconite; antimony; arsenic; tobacco; lobelia. Most poisons cause collapse toward the last.

The Patient is Delirious.—Belladonna (noisy, pleasing delirium, "the insane root that takes the reason prisoner"); hyoscyamus; stramonium; cannabis indica; alcohol; camphor.

The Patient is Tetanized.—Nux vomica; strychnin (think of vermin-killers); antimony; arsenic. There may be a condition approaching tetanus from excess of pain—in poisoning by strong ammonia, for example.

The Patient is Convulsed.—This may mean anything, the term being used vaguely. Antimony; arsenic; carbonic oxid; aconite. Strong acids, such as acetic or sulphuric, or strong alkalies, such as ammonia.

The Patient is Paralyzed.—Physostigmin; conium (from below upward); gelsemium; aconite; arsenic; lead.

The Pupils are Dilated.—Belladonna and atropin; hyoscyamus; stramonium; opium (in last stage); aconite; alcohol; chloroform (when taken in liquid form); conium.

The Pupils are Contracted.—Opium (very strongly if a large dose); physostigmin; chloral (during sleep).

The Skin Dry.—Belladonna and atropin; hyoscyamus; stramonium.

The Skin Moist.—Opium; aconite; antimony; alcohol; tobacco; lobelia. Almost any poison during the stage of collapse.

Rash on the Skin.—Belladonna (resembles rash of scarlet fever); stramonium (much like the belladonna rash); chloral (urticaria); arsenic (eczema, or may be like scarlet fever); antimony (pustular, like small-pox, but rare); opium (itching, followed by urticaria or papulous or roseolous patches, not common). Many other drugs excite cutaneous eruptions. For example, bromid of potassium and tar produce acne; copaiba, cubebs, and salicylic acid give rise to urticaria, and iodid of potassium may bring out a crop of petechiæ. Croton oil, tartar emetic, sulphur, hydrastis, and arnica are well-known rash-producers when applied locally. Murrell has known croton chloral hydrate, given for whooping-cough, to bring on urticaria. The discoloration of the skin resulting from the long-continued administration of silver requires no detailed mention.

Odor of the Drug on the Breath.—Prussic acid; laudanum; alcohol (brandy, whisky, etc.); carbolic acid; acetic acid; ammonia; chloroform; creosote; iodin; phosphorus; camphor; nitrobenzol. The odor is not always a reliable guide; for example, laudanum is not uncommonly taken in porter.

The Mouth and Tongue Dry.—Belladonna and atropin; hyoscyamus; stramonium; opium.

Salivation.—Arsenic; ammonia; cantharides. Most drugs which produce a corrosive action on the mucous membrane of the mouth or esophagus. Mercury, jaborandi, and muscarin may also be mentioned.

The Mouth Bleached.—Carbolic acid (mucous membrane white and hard); ammonia (epithelium coming off in flakes); potash; soda; nitric acid (white, soft, or yellow); corrosive sublimate. The numbness of the lips, mouth, and tongue, produced by aconite, will not be forgotten.

The Patient is Vomiting.—Arsenic (brown, mixed with blood); antimony (white, stringy mucus, may be tinged with blood); digitalis (vomited matter has a grass-green color); aconite; colchicum; colocynth; ammonia (stringy saliva mixed with blood, fumes with hydrochloric acid); phosphorus (vomited matter luminous in the dark).

The Patient is Purged.—Arsenic (continuous, with much pain, stools mixed with blood); antimony; corrosive sublimate (green in color, mixed with blood); cantharides (blood and slime); digitalis; colchicum; colocynth.

The Patient is Suffering from Colic.—Lead (about navel, eased by pressure); copper; arsenic; colocynth.

The Patient is Suffering from Cramp.—Arsenic; antimony; lead.

The Drug was Given Hypodermically.—Morphin; atropin; strychnin.

The Poison was Inhaled.—Ammonia; prussic acid; chloroform; ether; benzin; carbonic acid gas; carbonic oxid; coal-gas; sewer gas; cesspool gas and emanations.

Poisons Commonly Used for Murder.—Arsenic; antimony; aconite; digitalis; opium; strychnin; prussic acid.

Poisons Commonly Employed for Suicidal Purposes.—Opium and its preparations (commonest of all poisons); oxalic acid; rat paste; prussic acid;

chloral; sugar of lead; strychnin. Patent medicines of all kinds unintentionally.

Drugs Used Popularly as Abortifacients.—Ergot; rue; gin and pennyroyal; savin; bitter apple (colocynth, very popular); hickery pickery (hiera picra, or holy bitters, a mixture of 4 parts of aloes and 1 of canella bark); Spanish fly (cantharides); yew-tree tea; green tea in large quantities; quinin is often supposed to exert a specific action on the pregnant uterus; actæa racemosa (cimicifuga racemosa) is sometimes said to be an abortifacient, but there is very little truth in the statement; at all events, 1/2 of a dram of the tincture 3 times a day is safe enough even in the later months of pregnancy. Pulsatilla is supposed to be capable of producing abortion, but this again rests on very imperfect evidence. "A handful of parsley chopped fine in a bottle of gin, allowed to stand a week, and a wineglassful 3 times a day" (Hospital Patient). Parsley contains apiol, which is a powerful oxytoxic. Jaborandi was at one time supposed to exert a powerful action on the uterus, but the idea is now exploded.

Indigenous Poisonous Plants.—Woody nightshade (*Solanum dulcamara*); garden nightshade (*Solanum nigrum*); deadly nightshade (*Atropa belladonna*); aconite, monk's-hood, wolf's-bane or blue-rocket (*Aconitum napellus*); foxglove (*Digitalis purpurea*); spotted hemlock (*Conium maculatum*); arum (*Arum maculatum*); colchicum (*Colchicum autumnale*); bryony (*Bryonia dioica*); henbane (*Hyoscyamus niger*); fly agaric (*Amanita muscaria*); mezereon, or spruge olive (*Daphne mezereum*); laburnum (*Cytisus laburnum*); and a host of others. These will be found figured in Stephenson and Churchill's "Medical Botany," and in Bentley and Trimen's "Medicinal Plants."

General Principles of Treatment (Potter).

(1) Lose no time. (2) Use the best remedy obtainable at once. (3) Get rid of the poison. (4) Stop its action. (5) Remedy the mischief already done. (6) Fight against the tendency to death (Tanner). In the treatment of poisoning, whether by mineral or vegetable substances, if the poison is known the first indication is to administer the proper chemical *antidote*, so as to render it harmless or comparatively so. Next, the stomach should be emptied and washed out, lest the newly-formed compound be absorbed after a time; also to remove any poison which may have escaped the action of the antidote. Next, the appropriate *antagonist* should be administered, to counteract the effects of such portion of the poison as may have been absorbed. Lastly, such *antagonistic measures* should be employed as may sustain the action of any organic function showing signs of failure. In most cases of alkaloidal poisoning absorption has proceeded so far before professional assistance is obtained that antidotes are of no value, hence reliance can be placed only upon the physiological antagonist and such supporting measures as will tend to maintain vitality until the poison can be eliminated by the natural channels.

Antagonists are agents which oppose each other in their physiological action, and may be employed against each other as counterpoisons, to neutralize their effects upon the organism. They do their work in the blood and tissues, after absorption, and are especially available against poisons administered hypodermically, in which cases antidotes are useless. *Substances* so employed are generally the active principles of plants, a few being chemicals, as oxygen and chloral. *Antagonistic measures* include such proceedings as tend to neutralize the remote effects of poisons, as artificial respiration, faradism of the respiratory muscles, hot and cold applications, douching, constant motion or absolute repose, and the use of physiological (normal) salt solution to maintain circulation and increase elimination.

Antidotes affect a poison, either physically or chemically or both, so as to remove it from the body or alter its character before absorption, and thereby prevent its toxic action upon the organism. They do their work in the alimentary canal or in the respiratory passages, and are applicable to vegetable as well as mineral poisons, but they are not available against poisons administered hypodermically. Among them are emetics, cathartics, washes, injections, ligatures, poultices, the use of the stomach-pump, of tourniquets, etc., which are termed *mechanical antidotes;* and the *chemical* or *true antidotes*, which include albumin, milk, charcoal, soap, starch, oils, tannin, turpentine, acids, alkalies, potassium permanganate, carbonates, hydrates, sulphates, sodium chlorid, iodin, iron preparations, etc.

Acids.—Vegetable acids, as acetic (or vinegar), citric (or lemon-juice), and tartaric, are employed as antidotes against the poisonous alkalies and alkaline carbonates. Sulphuric acid, well diluted with water, is antidotal to the soluble salts of barium and lead, with which it forms insoluble sulphates; also as a prophylactic against lead poisoning.

Albumin is an ideal chemical antidote, being harmless, easily procured, and forming compounds (which are more or less insoluble) with most of the metallic salts, corrosive alkalies and mineral acids, as also with iodin bromin, chlorin, creosote, anilin, and alcoholic solutions of most of the alkaloids. It is especially suitable against inorganic poisons, and was recommended by Orfila for invariable use, even on the mere suspicion of poisoning. It should be well diluted, the whites of four eggs to a quart of lukewarm water; and should be followed by emetics and cathartics, as many of its compounds are soluble in an excess of itself.

Ammonia, diluted, used by inhalation, is an efficient antidote against the vapors of corrosive acids and nitrobenzol, also against chlorin, bromin, and hydrocyanic acid.

Calcium hydroxid and carbonate, in the form of lime-water, chalk, eggshells or powdered oyster-shells are used against acids, both mineral and organic, and especially against oxalic acid and the acid oxalates, which they neutralize and convert into the insoluble calcium oxalate.

Carbonates and bicarbonates of sodium and potassium are employed against most of the poisonous metallic salts, especially those of zinc, which they immediately decompose, forming insoluble basic compounds; also against iodin, bromin, and potassium dichromate, forming the neutral chromate with the latter and harmless salts with the former. They are useful in dilute solution against acids, but are less easily tolerated than magnesium sulphate. They are contraindicated in poisoning by oxalic acid, with which they form dangerous compounds. Ammonium carbonate, in dose of 5 grains, administered hypodermically in the vicinity of wounds caused by poisoned arrows, was repeatedly used by Dr. Parke, the surgeon of Stanley's last expedition in Africa, with entire success in saving life when it was employed immediately after the injury. Persons so wounded, if they were at too great a distance to receive this treatment, invariably died within a short time.

Cathartics are generally employed after the use of a chemical antidote, to remove the compounds formed thereby from the intestinal canal. The best are castor oil, croton oil, senna, and magnesium sulphate (Epsom salt). *Castor oil* protects the mucous membrane and obstructs absorption, but is contraindicated in poisoning by phosphorus, phenol, copper salts, or cantharis, the absorption of which is aided by oils and fats. *Croton oil* is rapid and powerful in the dose of from 1 to 5 minims, in a bread pill. *Magnesium sulphate,* in the dose of 1 to 4 ounces, well diluted, is of special service in chronic lead poisoning and to remove antidotal compounds from the intestines. Senna, gamboge, and other drastics are the best cathartics in narcotic poisoning.

Charcoal has some antidotal value against many alkaloids, the metallic salts, and phosphorus, slowing their toxic action and postponing their effects, probably by a protective action upon the gastric walls. It has the valuable property of absorbing gases, but enters into no fixed compound with any mineral or vegetable poison. Fresh animal charcoal is the best, though wood charcoal is efficient, but in less degree.

Chlorin in the form of chlorin water, Labarraque's solution, or Javelle water, is employed externally as an antidotal wash for snake-bites and other poisoned wounds; also, well diluted, internally against alkaloids and other vegetable and animal poisons; and as a spray for antidotal inhalation against coal gas (carbonic oxid), ammonia, phosphoreted and sulphureted hydrogen, also hydrocyanic acid.

Copper carbonate, in dose of 3 to 6 grains, with sugar and water, preceded and followed by an emetic, is recommended in phosphorus poisoning, being supposed to coat the particles of phosphorus first with a layer of copper phosphide and then with one of copper itself, thus preventing their solution in the fluids of the stomach.

Emetics, when employed, should be used without delay. They are often rendered needless by vomiting induced by the poison itself, or by the free use of diluent drinks; and are contraindicated when there is severe corrosion of the alimentary canal or when abdominal inflammation exists. The best emetics are: *Zinc sulphate,* for stomachal administration, being non-nauseating, 20 to 30 grains in water, 5 grains for children. *Apomorphin,* 1/16 to 1/8 grain, hypodermically, when narcosis prevents the use of emetics by the mouth. It should be administered hypodermically, as it is very uncertain in action when given otherwise. The following may be used: Copper sulphate, 1 to 5 grains in water; ipecac. in powder; emetin, 1/12 to 1/3 grain; tartar emetic, 1 1/2 grain, acts slowly and is depressant; turpeth mineral; cadmium sulphate; sodium chlorid (common salt), 2 teaspoonfuls in a pint of water; mustard, 2 teaspoonfuls in a cup of warm water; also olive oil, soap-suds, snuff, melted fats, and tickling the fauces with the finger or a feather. *Sodium chlorid* as an emetic is contraindicated in poisoning by tartar emetic or corrosive sublimate, and so also are oils and fats and substances containing them, in poisoning by phosphorus, cantharis, phenol or copper salts.

Gelatin is of especial value against iodin, bromin and the alums, but requires too much time for its preparation, as it should be broken up, soaked in water for half an hour and reduced to the consistency of honey.

Gluten is of value against corrosive sublimate, but is less so than albumin and is not easily obtained.

Gum arabic, in the form of mucilage, is chiefly used as a protective against corrosive poisons, and has been recommended in copious draughts against poisoning with the bismuth salts.

Iodin, in very dilute solution, is used as an antidote against alkaloids and their salts, other vegetable poisons, and snake-venom. All its compounds are more or less soluble and toxic, and must therefore be removed from the system as soon as possible. *Bouchardat's antidote for vegetable poisons* consists of 3 grains of iodin, 30 grains of potassium iodid and 11 ounces of distilled water. The dose, which is from 1 1/2 to 3 ounces, should be repeated frequently.

Iron.—The **hydroxid** $Fe(OH)_3$, is by far the best antidote to arsenic in solution or in a soluble form, as it combines with the latter to form a ferrous arsenate, and also protects the gastrointestinal mucous membrane against the local action of the poison. In the proportion of 10 parts to one of arsenic the union is very complete, but its union with the salts of arsenic is limited even when it is in great excess, though much more effectual if there is added to it a small amount of ammonia or other caustic alkali, or if the basic ferric acetate is mixed with it. For the preparation of the official arsenic antidote see ARSENIC. Dialyzed iron, saccharated iron, and the basic ferric acetate have all been used with more or less success in arsenic poisoning.

Magnesia (MgO), is obtained by heating magnesium carbonate, which is a compound of the hydroxid and carbonate of magnesium with water. When the carbonate is heated at a low temperature it becomes calcined, losing CO_2 and H_2O; then mixed with 25 times its weight of warm water it becomes gelatinized, in which condition it is best for antidotal purposes, in doses of from 1 1/2 to 2 ounces, at short intervals for a few doses, then at longer intervals. An excess does no harm, but rather benefits the patient by its cathartic action. Magnesia is the most efficient antidote against acids and the acid salts, also against oxalic acid and the acid oxalates, in the absence of the calcium antidotes therefor. It is also valuable against arsenic, phosphorus, mercury, corrosive sublimate and other metallic salts in solution, precipitating the corresponding oxids or basic salts.

Milk is a good substitute for albumin, its antidotal action being nearly the same in range and due to its casein, albumin and free alkali. It is particularly valuable against metallic salts, corrosive acids and alkalies (especially ammonia) and the alkaline earths, but it is contraindicated when fatty antidotes are to be avoided, by reason of its richness in fat.

Oils and Fats are efficient against the corrosive acids and alkalies, the metallic oxids and salts; but are contraindicated in poisoning by phosphorus, cantharis, phenol, or copper salts, the absorption of which they promote. With the caustic alkalies they unite to form soaps, liberating glycerin; they are inferior to albumin against the metallic salts, and as their action is slow they are less efficient than acids against alkalies. Those used are olive, cotton-seed, linseed and almond oils, also melted butter and lard.

Potassium ferrocyanid, given in doses of 30 to 60 grains in water, is of special value against the copper salts, but albumin is equally efficient and more easily obtained.

Potassium permanganate is the best antidote against organic poisons, if used promptly, before absorption has taken place, as it rapidly destroys them by oxidation. It has been used successfully against morphin and strychnin salts and phosphorus in the stomach, and locally for snake-poison.

Soap, as Castile soap, dissolved in 4 times its bulk of hot water, to make "suds," and given by the cupful, is one of the most efficient antidotes against corrosive acids and metallic salts, especially corrosive sublimate, potassium dichromate, and salts of tin and zinc. It is inferior to albumin against these, but is preferred to caustic alkalies against acids, as of itself it has no corrosive action. It should not be used against alkalies.

Sodium borate (borax), in milk (5 percent), is recommended as a convenient and efficient general antidote; acting by the alkaline effect of the sodium, which precipitates metallic hydroxids from solutions of their salts, and also precipitates alkaloids from their salts. The milk acts by virtue of its albumin, forming albuminates and casein compounds with the poisons. The stomach should always be evacuated after the use of this agent, as the compounds formed are soluble in the digestive fluids.

Sodium chlorid (common salt), in dilute solution, is the best antidote against the silver salts, converting them into the insoluble chlorid of silver. It may be given with albumin, which is also a very efficient antidote in this form of poisoning.

Sodium thiosulphate in doses of 15 grains, in very dilute solution and frequently repeated, is a valuable antidote against bleaching powder (calcium hypochlorite), Labarraque's solution (sodium hypochlorite), and Javelle water (potassium hypochlorite), which it reduces to chlorids, itself undergoing oxidation to the sulphate.

Starch, in paste, 1 to 15 of water, is the antidote for iodin and bromin, with which it forms compounds which are almost harmless. It has some value against corrosive acids, corrosive sublimate, and zinc and copper sulphates, but it is not so efficient as albumin, which is preferred for these poisons as well as for iodin, since it has a greater affinity than starch has therefor.

Stomach pump and stomach siphon are efficient, and do not weaken the patient as emetics do, but they are not always available, and cannot be used when there is corrosion of the stomach or esophagus, for fear of perforation. Washing of the stomach at regular intervals is a measure of great importance in the case of soluble poisons, some of which are excreted into the stomach. These appliances are almost useless when the poison is in solid form and in large pieces (as meat, sausage, fish, cheese).

Sulphates of magnesium and sodium (Epsom and Glauber's salts), the soluble sulphates, are particularly efficient against phenol and the salts of barium and lead.

Tannin (tannic acid), precipitates the alkaloids and their salts, with which it forms compounds (tannates), which, though comparatively insoluble are not entirely inactive, and should be removed at once from the alimentary canal by emetics and drastic purgatives. It acts well against many metallic salts, though inferior to albumin for these, except against tartar emetic, which albumin does not affect, but tannin renders harmless. It is given in doses of 15 to 45 grains in a 2 percent solution, every quarter of an hour; and if combined with about 10 percent of its weight of iodin its antidotal effect on vegetable poisons is greatly increased. If not itself obtainable, decoctions or infusions of substances containing it may be used, as tea and coffee, nut-galls, kino, rhatany, catechu, and the barks of oak, willow and cinchona.

Turpentine, after long exposure to the air, therefore containing much oxygen, is one of the antidotes against phosphorus. It should be administered immediately after the ingestion of that poison, alone or in hot water, and in quantity 100 times that of the phosphorus supposed to be present.

Antidote bag, designed by Martindale, of London, contains the following-named articles, labeled, with directions for use, viz.: Dialyzed iron, syrup of chloral, chloroform, spirit of chloroform, calcined magnesia, aromatic spirit of ammonia, oil of turpentine, acetic acid, tincture of digitalis, tannic acid, amyl nitrite, zinc sulphate, ipecacuanha, potassium bromid, potassium permanganate. Solution of ferric sulphate, 40 c.c. in 125 c.c. of water. Magnesia, in solution, 10 grams in 750 c.c. of water, in a bottle of 1000 c.c. capacity. These two, mixed together, make the official antidote against arsenic. Also a hypodermic syringe, and solutions or pellets therefor of morphin sulphate, atropin sulphate, apomorphin hydrochlorid, pilocarpin nitrate, strychnin nitrate.

General antidotes have been devised for use when the nature of a poison is unknown, with the object of a "shot-gun prescription," intended to hit something. One of the best is Jeaunel's, composed as follows: Liquor ferri sulphatis (specific gravity, 1.45), 2 1/2 ounces; magnesium oxid, 2 ounces; carbo animalis, 1 ounce; aqua, 20 ounces. These ingredients should be kept separate—the solution of the sulphate in one vessel, the others together. When needed, the former should be added to the latter and violently agitated. Dose, 1 1/2 to 3 ounces. This is a perfect antidote to arsenic, zinc, digitalin. It delays the action of salts of copper, morphin, and strychnin, and slightly influences compounds of mercury. It is valueless for cyanid of mercury, tartar emetic, hydrocyanic acid, phosphorus, or the caustic alkalies.

Bellini, of Florence, considers the iodid of starch a valuable antidote to alkaline sulphids, earthy sulphids, vegetable and caustic alkalies, and ammonia. In the first two cases he considers it superior to all other antidotes.

A fresh mixture of the sulphids of iron and sodium with magnesia is said to be a perfect antidote for copper salts, corrosive sublimate, and mercuric cyanid. If the nature of the poison is entirely unknown, a harmless yet effectual antidote in most cases is one composed of equal parts of magnesia, wood charcoal and the ferric hydroxid, given freely in plenty of water.

The following table of poisons includes the names of the various poisonous substances, the particularly prominent symptoms, the mode of producing death, and the antidotes and general treatment. Tables showing the anatomic distribution of lesions in death from poisoning and the lesions characteristic of the more important poisons are given under POISONING (Medicolegal Duties in Fatal Cases).

POISONS, TABLE OF.

NAME.	SYMPTOMS OF POISONING.	MODE OF PRODUCING DEATH.	TREATMENT AND ANTIDOTES.
Acetanilid	Cyanosis; peculiar discoloration of the blood due to formation of methemoglobin.	Sudden cardiac failure.	Strychnin, oxygen, and warmth; heart-stimulants.
Acetic Acid. See *Acid, Acetic.*			
Acetphenetidin. See *Phenacetin.*			
Acid, Acetic	Vomiting, purging; pain in the stomach, foul breath.	Asphyxia	Alkalies; soap; demulcent drinks; opium.
Acid, { Arsenous. Arsenic. } See *Arsenic.*			
Acid, Boric	Nausea, vomiting, erythema, rapid, feeble pulse, collapse.	Cardiac paralysis.	
Acid, Carbolic (*Phenol*)	Immediate burning pain from mouth to stomach; giddiness, loss of consciousness, collapse; subnormal temperature; partial suppression of urine, which is dark in color; pupils very much contracted; characteristic odor.	Respiratory and cardiac paralysis.	Wash out stomach with alcohol and water; hypodermic of apomorphin; magnesium sulphate; atropin.
Acid, Chromic	Yellow stains; abdominal pain; vomiting and purging; collapse.	Cardiac paralysis	Evacuate; chalk, milk, or albumin; demulcent drinks.
Acid, Hydrochloric (*Muriatic*).	Pain throughout digestive tract; vomiting, feeble pulse, clammy skin, collapse; eschars externally; yellow stains on clothing, but none on skin.		Alkalies; demulcent drinks; oil; stimulants (intravenous injection).
Acid, Hydrocyanic (*Prussic*).	Sudden unconsciousness, slow labored respirations, slow pulse, staring eyes, purple face, general convulsions, then relaxation and collapse, odor of peach kernels; death may be almost instantaneous.	Asphyxia	Stomach tube if possible. Dilute ammonia; opium, to relieve pain; alternate cold and warm affusions; atropin and heart-stimulants; artificial respiration.
Acid, Lactic	Violent irritation of alimentary canal.		Alkalies and demulcents.
Acid, Nitric	Yellow stains on skin; otherwise similar to *Acid, Sulphuric.*		Alkalies; demulcents; soap; stimulants.
Acid, Nitrohydrochloric.	Same as *Acid, Nitric.*		
Acid, Oxalic	Hot, acrid taste; burning, vomiting, collapse; sometimes general paralysis, numbness and stupor.	Paralysis of respiration and of heart.	Lime or chalk.

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Acid, Prussic. See *Acid, Hydrocyanic.*			
Acid, Pyrogallic	Vomiting, diarrhea, rigors, fever, black urine, great dyspnea.	Formation of thrombi.	Mineral acids; alkalies; salts of iron.
Acid, Salicylic	Mydriasis; quick and deep respiration; delirium; dyspnea; lessened arterial pressure; deafness; olive green urine.	Respiratory paralysis.	
Acid, Sulphuric	Black stains; pain throughout digestive tract, vomiting often of tarry matter, feeble pulse, clammy skin, profuse and bloody salivation.	Asphyxia	Chalk; magnesia; soap; demulcent drinks.
Acid, Sulphurous	Cough, bloody expectoration, pulmonary inflammation.		Air; cold to head; artificial respiration; bleeding.
Acid, Tartaric	Pain in abdomen; vomiting, etc.		Magnesia; lime; soap.
Aconitum napellus (*Monkshood*). Aconite.	Sudden collapse, slow, feeble and irregular pulse and respirations, tingling in the mouth and extremities, giddiness, great muscular weakness, sometimes pain in the abdomen, pupils generally dilated, but may be contracted, marked anesthesia of skin, mind clear, convulsions at times.	Asphyxia	Tannic acid solution for washing out stomach; digitalis, atropin, and stimulants; artificial respiration; warmth and friction.
Actæa spicata (*Baneberry*)	Vomiting; diarrhea; cardiac depression; faintness; dizziness; foul breath; dryness of pharynx.	Cardiac paralysis	Heart-stimulants.
Agaricus. See *Fungi.*			
Alcohol	Confusion of thought, giddiness, tottering gait, slight cyanosis, narcosis from which patient can be aroused; full pulse; deep stertorous breathing; injection of eyes, dilatation of pupils, low temperature, convulsions, coma, death often hours or even days after apparent recovery.	Paralysis of heart	Evacuate stomach; coffee; battery; amyl nitrite; hot and cold douches.
Aloes	Tenesmus, weight in pelvis, profuse diarrhea.		
Amanita muscaria (*Truffles*). See *Fungi.*			
Ammonium and its compounds.	Intense gastroenteritis, often with bloody vomiting and purging; lips and tongue swollen and covered with detached epithelium; violent dyspnea; characteristic odor.	Asphyxia	Vegetable acids; demulcents.
Amygdalus communis (*Bitter Almond*).	Similar to *Acid, Hydrocyanic, q. v.*		
Amyl Nitrite	Throbbing headache, flushed face, sense of heat, tumultuous heart's action; diminished sensibility, mobility and reflexes.	Paralysis of respiratory centers.	Evacuate; air; recumbent position; artificial respiration; stimulants; strychnin; ergot; digitalis.
Amylene Hydrate	Sleep and coma	Paralysis of medulla.	Remove vapor; air; stimulants; artificial respiration.
Anilin	Giddiness, apparent intoxication, sweating, blue color of mucous membrane of mouth; odor of anilin; coma.	Asphyxia	Removal of cause; stimulation; oxygen; artificial respiration.
Antifebrin. See *Acetanilid.*			
Antimony and its compounds.	Metallic taste, violent vomiting becoming bloody; feeble pulse, pain and burning in the stomach, violent serous purging, becoming bloody; dysphagia; cramps in extremities; thirst; great debility; sometimes prostration, collapse, unconsciousness, and convulsions without vomiting or purging.	Paralysis of the heart.	Tannic acid; demulcent drinks; opium; alcohol; external heat.

POISONS, TABLE OF.

NAME.	SYMPTOMS OF POISONING.	MODE OF PRODUCING DEATH.	TREATMENT AND ANTIDOTES.
Antipyrin (*Phenazon*)	Headache, nausea, vomiting, a rash like that of measles, vertigo, drowsiness, deafness, confusion of ideas, cyanosis, collapse.		Recumbent position: warmth; strychnin; stimulants; oxygen; artificial respiration.
Apocynum androsæmifolium (*Dogsbane*).	Vomiting, nausea, drowsiness		Evacuate; stimulants.
Apomorphin	Violent vomiting, paralysis of motor and sensory nerves, delirium, depression of respiration, heart-depression.	Cardiac failure	Cardiac and respiratory stimulants.
Aristolochia clematis (*Birthwort*).	Nausea; griping pains in the bowels; vomiting; dysenteric tenesmus.		Evacuate; demulcent drinks.
Arnica montana (*Leopardsbane*).	Transient excitement, headache, unconsciousness, pupils dilated, paralysis of the nervous system, collapse.	Paralysis of the nervous system.	Cardiac stimulants.
Arsenic and its compounds	Violent burning pain in the stomach, retching, thirst, purging of blood and mucus with flakes of epithelium; tenesmus, burning in the urinary organs with suppression of urine; sense of constriction with dryness in throat; pulse small and frequent.		Hydrated sesquioxid of iron; precipitated carbonate of iron; emetics; castor oil; demulcents.
Artemisia absinthium (*Absinthe*).	Tremor, stupor, epileptiform convulsions, involuntary evacuations, stertorous breathing.		Emetics; stimulants; demulcents.
Aspidium (*Male Fern*)	Vomiting, purging, great pain in the abdomen, collapse; giddiness; coma; amaurosis; cramp in extremities.		Evacuate; stimulants.
Atropa belladonna (*Deadly Nightshade*). Atropin. Belladonna. Homatropin.	Heat and dryness of the mouth and throat; pupils widely dilated, scarlet rash; quick pulse, at first corded, later feeble; rapid respirations, early strong, late shallow and feeble; retention of urine; sometimes convulsions, collapse, and paralysis; suppression of saliva, difficulty in swallowing; great thirst, indistinct vision, noisy delirium; skin dry.	Paralysis of the heart.	Evacuation of stomach and bladder; stimulants: coffee; pilocarpin; artificial respiration; physostigmin may be of benefit.
Barium and its compounds	Pain in the abdomen, purging, vomiting, feeble pulse, short and labored breathing, cramps, convulsions, collapse.		Evacuate; Glauber's or Epsom salts; dilute sulphuric acid; warmth.
Bitter Almond (*Amygdalus*)	Similar to *Acid, Hydrocyanic, q. v.*		
Bittersweet. See *Solanum.*			
Bloodroot. See *Sanguinaria.*			
Boric Acid. See *Acid, Boric.*			
Bromin and its compounds	Respiration and heart's action lessened; reflexes sluggish; diminished sensibility; motility and sexual function impaired; acne; fetid breath; mental faculties impaired	Cardiac and muscular paralysis.	Heat; stimulants; digitalis; ergot; atropin; strychnin; artificial respiration.
Brucin. See *Strychnin.*			
Bryonia dioica (*Bryony*)	Giddiness, delirium, vomiting, diarrhea, with watery motions, dilated pupils, coma.	Heart-depression	Emetics; mustard; salt: ipecacuanha; stimulants, freely.
Caffea arabica. See *Caffein.*			
Caffein	Burning pain in the throat, giddiness, faintness, nausea, numbness, abdominal pain, great thirst, dry tongue, tremor of extremities, diuresis, weak pulse, cold skin, collapse.	Paralysis of respiration.	Emetics; stimulants; warmth; morphin and atropin.
Calabar Bean. See *Physostigma.*			

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Calcium. See *Lime.*			
Camphine. See *Turpentine.*			
Camphor	Characteristic odor; languor, giddiness, disturbance of vision, delirium, convulsions, clammy skin, smarting in the urinary organs, pulse quick and weak; no pain, no vomiting, no purging.	Asphyxia	Evacuate stimulants; warmth; hot and cold douches.
Cannabis indica (*Indian Hemp*).	Pleasurable intoxication; sense of prolongation of time; anesthesia with loss of strength especially in legs; rapid pulse; increased sexual desire; pupils dilated; heavy sleep.	....	Strychnin; faradisation; evacuate; stimulants.
Cantharis vesicatoria (*Spanish Fly*). Cantharides.	Burning in mouth and stomach, vomiting and purging, soon becoming bloody, and abdominal tenderness, tenesmus, the vomit containing shining particles of the powder; incessant desire to urinate, but only a little blood or albuminous urine passed at each attempt; priapism, abortion, convulsions, coma, and insensibility.	Paralysis of the respiratory centers.	Evacuate stomach; demulcent drinks; morphin; hot bath for the strangury; anesthetics may be necessary for the pain.
Carbolic Acid. See *Acid, Carbolic.*			
Carbon Disulphid	Headache, vertigo, nervous excitement, anesthesia with great muscular rigidity, characteristic odor of breath, urine, and feces.	Paralysis of the respiratory centers and of the heart.	Evacuate; stimulants; warmth; artificial respiration.
Castor-oil. See *Ricinus.*			
Chelidonium majus (*Celandine*).	Catharsis; vomiting; cardiac debility	Paralysis of the heart.	Evacuate; heart-stimulants.
Cherry Laurel. See *Prunus.*			
Chloral Hydrate	Deep sleep, loss of muscular power, lividity, reflexes diminished, pulse weak, respirations slowed, pupils contracted during sleep, but dilated on waking, temperature low.	Arrest of respiration or paralysis of the heart.	Evacuate; heat to the extremities; massage; coffee by the rectum; strychnin; amyl nitrite; artificial respiration.
Chlorin	Irritation of the throat, cough, tightness across chest, inability to swallow.	Asphyxia	Air; steam-inhalations; dilute ammonia-inhalations; ether or chloroform.
Chlorodyne. See *Opium.*			
Chloroform	Two methods of introduction, inhalation and swallowing; symptoms in latter case delayed. 1. Slight stimulation; 2. excitement and incoherence; 3. insensibility and relaxation.	Usually paralysis of the heart.	Draw tongue forward; air; artificial respiration; faradic current; hot and cold douches; amyl nitrite; atropin; evacuation of stomach if chloroform has been taken by mouth.
Chromium and its compounds. See *Acid, Chromic.*			
Cicuta maculata (*American Hemlock*).	Similar to those of *Conium, q. v.*		
Cicuta virosa (*Water Hemlock*).	Similar to those of *Conium, q. v.*		
Citric Acid. See *Acid, Citric.*			
Coal-gas	Headache, giddiness, loss of muscular power, unconsciousness, pupils dilated, breathing labored, coma, odor of gas.	Asphyxia	Fresh air; artificial respiration; ammonia; stimulants; oxygen; coffee; hot and cold douches.
Cocain	Faintness, giddiness, nausea; pulse small, rapid, and intermittent; severe prostration; respiration slow and feeble.	Spasm of heart and muscles of respiration.	Stimulants; amyl nitrite; artificial respiration.

POISONS, TABLE OF.

NAME.	SYMPTOMS OF POISONING.	MODE OF PRODUCING DEATH.	TREATMENT AND ANTIDOTES
Cocculus indicus (*Fish-berries*) Picrotoxin.	Nausea, vomiting, muscular debility, somnolence, sometimes convulsions, occasionally scarlatinal rash.	Paralysis of heart in diastole.	Evacuate; chloral hydrate; bromid of potassium.
Colchicum autumnale (*Meadow Saffron*).	Not unlike those of malignant cholera; griping pain in the stomach, vomiting and continuous purging of seromucous material; intense thirst, muscular cramps, great prostration; pinched face, profuse perspiration, collapse; dilated pupils; pain in the extremities.	Paralysis of the respiratory centers.	Evacuate; tannic or gallic acid; demulcent drinks; stimulants; morphin.
Colocynth....................	Persistent vomiting and purging, exhaustion, cold extremities, weak pulse, collapse.	....	Evacuate; camphor, opium; stimulants; demulcent drinks; warmth.
Conium maculatum (*Hemlock*).	Weakness of the legs, gradual loss of all voluntary power, nausea, ptosis, pupils dilated, inability to speak or swallow.	Paralysis of the respiratory muscles.	Evacuate; tannic or gallic acid; stimulants; warmth; artificial respiration; atropin.
Convallaria majalis (*Lily of the Valley*).	Similar to *Digitalis*, *q. v.*................	Cardiac paralyzant; arrests heart in systole.	
Convolvulus jalapæ. See *Jalap*.			
Convolvulus scammonii.			
Copper and its salts.........	Metallic taste in mouth, griping and colicky pains, nausea and vomiting, purging with straining, jaundice, hurried breathing, small, rapid pulse, weakness, thirst, giddiness, coma.	....	Evacuate; barley-water; morphin; poultices to abdomen.
Coriaria myrtifolia (*Myrtle-leaved Sumach*). See *Sumach*.			
Creosote....................	Similar to *Acid, Carbolic*, *q. v.*		
Croton tiglium (*Croton-oil*)...	Intense pain in the abdomen, vomiting, purging, watery stools, pinched face, small and thready pulse, moist skin, collapse.	....	Evacuate; demulcent drinks; camphor; stimulants; morphin; poultices to abdomen.
Cubebs.....................	Nausea, vomiting, colicky pains; in some cases purging; in some an eruption resembling urticaria.		
Cucumis colocynthis. See *Colocynth*.			
Curare (*Indian War-poison*)..	Complete paralysis of the voluntary muscles, slowing of the heart, gradually diminished respiration.	Arrest of the respiratory movements.	Artificial respiration; stimulants; ligate and wash wound; evacuate bladder frequently.
Cyanogen and its compounds.	Similar to *Acid, Hydrocyanic*, *q. v.*		
Cyclamen europæum (*Sowbread*).	Inflammation of the alimentary canal; bloody stools; cold sweats; convulsive movements.	....	Evacuate; opium; poultices to abdomen.
Cytisus laburnum (*Laburnum*).	Come on rapidly; purging, vomiting, great restlessness; drowsiness and insensibility, convulsive twitchings.	Asphyxia..........	Evacuate; stimulants; coffee per rectum; hot and cold douches.
Daphne gnidium (*Sponge Flax*).	Pain; vomiting; purging................	....	Evacuate; demulcent drinks; heart-stimulants.
Daphne mezereum (*Mezereon*). See *Mezereon*.			
Datura stramonium (*Thorn-apple, Jamestown Weed*).	Symptoms and treatment similar to those of *Atropin*, *q. v.*		
Delphinium staphisagria (*Stavesacre*). See *Staphisagria*.			

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Digitalis purpura (*Fox-glove*).	Purging, with severe pain, violent vomiting; vertigo; feeble pulse, although heart's action is tumultuous; headache; lethargy followed by delirium and convulsions; eyes prominent, pupils dilated, sclera blue; skin cold, coma.	Heart-paralysis.	Evacuate; tannic and gallic acids; stimulants; aconite; recumbent position.
Dog-bite. See *Saliva*.			
Duboisia (probably identical with *Hyoscyamus*).			
Elaterium (*Elaterin*).	Purging, vomiting, salivation, prostration, clonic spasms; dyspnea.		Emetics; stomach-pump; demulcent drinks; opium.
Ergot.	Tingling in the fingers and feet, cramps in the extremities, dizziness, weakness, pupils dilated, pulse small, vomiting, retching, and diarrhea.		Evacuate, quick purgatives, castor-oil or Epsom salts; tannic or gallic acid; recumbent position; stimulants; amyl nitrite.
Erythroxylon coca. See *Cocain*.			
Eserin. See *Physostigma*.			
Ether.	Sense of strangulation; cough, stage of excitement (*cerebral intoxication*). Tetanic convulsive stage, complete insensibility, muscles relaxed, reflexes abolished, cerebral functions suspended.	Paralysis of respiration.	Withdraw vapor; lower the head; draw tongue forward; atropin; artificial respiration; amyl nitrite; ammonia; warmth.
Ethidene Dichlorid.	Stertorous breathing, dilated pupil, pleasant dreams, depression of pulse.		Remove vapor; draw tongue forward; artificial respiration; lower the head.
Ethyl Bromid.	Very similar to those of *Chloroform*, *q. v.*		
Euphorbia officinarum (*Euphorbia Spurge*).	Pain; nausea; vomiting; purging; weak pulse.	Paralysis of cardiac and respiratory centers.	Evacuate; heart-stimulants.
Exalgin.	Numbness and tingling, cyanosis, salivation, vomiting, intense dyspnea feeling of alternate expansion and contraction of the head.	Paralysis of respiration.	Emetics; strychnin; stimulants.
Filix mas (*Male Fern*). See *Aspidium*.			
Fish, Poisonous. (Several kinds of fish, particularly shell-fish, are constantly poisonous, while some are so only to particular constitutions.)	Nausea, vomiting, irritation of eyes, depression, severe urticaria, or nettle-rash.		Evacuate; quick purgative; stimulants.
Fish-berries. See *Cocculus*.			
Fly, Spanish. See *Cantharis*.			
Foxglove. See *Digitalis*.			
Fungi. (Several forms of fungi, known as mushrooms, toadstools, truffles, etc., are directly poisonous.)	Gastrointestinal catarrh, nausea, heat and pain, vomiting and purging, fainting, convulsions, small and frequent pulse; pupils dilated; delirium, stupor, death.		Evacuate; quick purgative; Glauber's or Epsom salts; stimulants.
Fusel-oil.	Rigidity of muscles, respiration shallow and slow, pupils small, odor of breath resembling amyl nitrite.		Evacuate; heart stimulants.
Gamboge.	Violent irritation of alimentary canal; vomiting; griping.		Evacuate; demulcent drinks; opium.
Gaultheria procumbens (*Wintergreen*).	Very similar in action to *Acid, Salicylic*, *q. v.*		
Gelsemium sempervirens (*Yellow Jessamin*).	Symptoms appear in about 20 minutes; great muscular weakness; dimness of vision, ptosis, diplopia, labored respiration, weak pulse.	Paralysis of the respiratory centers.	Evacuate; atropin; stimulants; artificial respiration; hot and cold douches.

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Glass	Purely irritant; may have hematemesis		Bread in crumbs, then emetic.
Gold	Causes a pink stain upon the skin		Sulphate of iron; albumin; evacuate.
Gratiolus officinalis (*Hedge-hyssop*).	Violent purging; pain		Evacuate; demulcent drinks
Hedeoma (*Pennyroyal*)	Unconsciousness, extremities cold, pulse small, pupils slightly dilated, vomiting, delirium, opisthotonos.		Evacuate.
Hellebore, Green and White. See *Veratrum*.			
Helleborus niger (*Black Hellebore*).	Resemble malignant cholera; abdominal pain, vomiting, purging, vertigo, cold sweats, and collapse.	Paralysis of heart.	Stomach-pump; tannin; mucilaginous drinks; heart-stimulants.
Hemlock. See *Conium*.			
Henbane. See *Hyoscyamus*.			
Holly Berries (*Ilex aquifolium*).	Vomiting, pain in the head and abdomen, purging, contraction of pupils, loss of consciousness, collapse.		Evacuate; stimulants; warmth; coffee.
Homatropin. See *Atropa*.			
Hura crepitans (*Sand-box*)	Irritation of alimentary tract; vomiting; purging.		Evacuate; demulcent drinks; opium.
Hydrophobia. See *Saliva*.			
Hyoscyamus albus (*White Henbane*). Hyoscyamus niger (*Black Henbane*). Hyoscyamin, Hyoscin.	Giddiness, sense of weight in head, general loss of power, pupils dilated, diplopia, presbyopia, flashes of light, incoherence of speech, delirium, insensibility, coma.	Paralyses respiration.	Evacuate; quick purgatives.
Insects, Poisonous. (The bite or sting of several varieties of insects is poisonous.)	In most cases slight; in cases of tarantula and scorpion may be more serious; pain, swelling, fever, erysipelas, suppuration, and gangrene, with death.		In *milder* cases ammonia, soap, or other alkali to the wound. In *graver* cases similar to that of snake-bite, *q. v.*
Iodin and its compounds	Pain in throat and stomach; vomiting, purging; vomit yellow from iodin, or blue if starch be present in the stomach; giddiness, faintness, convulsive movements.	Paralysis of the heart.	Evacuate; starch; amyl nitrite; morphin.
Iodoform	Slight delirium; drowsiness; high temperature, rapid pulse; resembles meningitis.		
Ipecacuanha (*Ipecacuanha*)	Vomiting, hematemesis, and hemoptysis		Evacuate.
Iron and its compounds	Metallic taste, pain, vomiting, and purging; vomited matter black.		Magnesia and diluents; ice and opium.
Jaborandi. Pilocarpin.	Copious sweating, dizziness, salivation, vomiting, diarrhea, tearing pain in eyeballs, myopia, pupils much contracted.		Evacuate; stimulants; atropin or belladonna.
Jalap	Copious watery stools, tormina, and tenesmus.		Evacuate; demulcent drinks.
Jamaica Dogwood. See *Piscidia*.			
Jatropha curcas (*Indian Nut*)	Purging; vomiting		Evacuate; demulcent drinks.
Jatropha manihot (*Cassava*)	Same as those of *Prussic Acid*, *q. v.*		
Juniperus sabina. See *Savin*.			
Juniperus virginiana (*Red Cedar*).	Gastritis; nephritis; strangury; nervous disturbances; violet-like odor in urine; copaiba-like erythema.		Evacuate; demulcent drinks; stimulants.

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
Lactic Acid. See *Acid, Lactic.*			
Lactuca virosa (*Strong-scented Lettuce*).	Somewhat similar to those of *Opium, q. v.*		
Laudanum. See *Opium.*			
Lead and its compounds	Dryness of the throat, metallic taste, great thirst, colic relieved by pressure, abdominal muscles usually rigid, constipation, cramps in the legs, paralysis of the extremities, convulsions; in the chronic forms, a blue line at margin of the gums.		Evacuate; dilute sulphuric acid; Epsom and Glauber's salts; milk; morphin; iodid of potassium to eliminate the poison; poultices to the abdomen.
Lime	Burning pain in the abdomen, great thirst, obstinate constipation.		Vegetable acids; demulcent drinks.
Lobelia inflata (*Indian Tobacco*).	Severe vomiting, with intense depression and prostration, giddiness, tremors, convulsions, collapse.	Paralysis of respiration.	Evacuate stomach; tannic or gallic acid; stimulants; strychnin; warmth; recumbent position.
Lolium temulentum (*Darnel*).	Vertigo; dizziness; headache; sleepiness.		
Lytta vittata (*Potato-fly*)	Similar to those of *Cantharis, q. v.*		
Male fern. See *Aspidium.*			
Meat. (Putrefactive changes in meat and some other forms of food produce active poisonous agents known as ptomains.	Gastrointestinal irritation sometimes very marked; occasionally death.		Evacuate; irrigate stomach; sedatives; supportive treatment when prostration.
Melia azedarach (*Pride of China*).	Giddiness, dimness of vision, stertorous breathing, dilated pupils, stupor.		
Mercury and its compounds	Acrid metallic taste, burning heat in throat and stomach, vomiting, diarrhea, with bloody stools, lips and tongue white and shriveled, pulse small and frequent, death in coma or convulsions; pain may be absent. Secondary symptoms: hectic fever, coppery taste, fetid breath, gums swollen, salivation.		Albumin in some form; raw white of egg or flour; evacuate; potassium iodid; opium.
Methylene Bichlorid	Symptoms and treatment similar to those of *Chloroform, q. v.*		
Mezereon	Violent purging, vomiting, nephritis, and gastroenteritis; an exceedingly powerful local irritant.		Evacuate; aperient and demulcent drinks; opium.
Milk. See *Tyrotoxicon.*			
Momordica elaterium (*Squirting Cucumber*).			
Morphin. See *Opium.*			
Mushrooms. See *Fungi.*			
Mussel. See *Fish.*			
Mydalin. See *Meat.*			
Myristica fragrans (*Nutmeg*)	Thirst; tightness in the chest; vomiting		Coffee and stimulants
Mytilotoxin (*Mussel-poison*). See *Fish.*			
Naphthalin	Cyanosis, twitching over body, urine dark-brown changing to inky black, strangury.		Demulcent drinks; stimulants.
Narcein. See *Opium.*			
Narcissus pseudonarcissus (*Daffodil*).			Evacuate; demulcent drinks; stimulants.

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes
Nerium oleander (*Oleander*)	Similar to those of *Strophanthus*, *q. v.*		
Neurin. See *Meat.*			
Nicotiana tabacum. See *Tobacco.*			
Nightshade. See *Atropa.*			
Niter (*Potassium Nitrate*). See also *Potassium and its compounds.*	Pain in the abdomen, vomiting, coldness in the limbs, partial paralysis, tremors, convulsions, collapse.	Paralysis of the heart.	Evacuate; mucilaginous drinks; stimulants; warmth; amyl nitrite; atropin.
Nitric Acid. See *Acid, Nitric*			
Nitrobenzin Nitrobenzol.	May be delayed; weariness, numbness in the head, confusion, marked cyanosis, lips nearly black, convulsions, pupils dilated.	Asphyxia	Cold to head; dilute ammonia; hydrated oxid of iron; stimulants; artificial respiration.
Nitroglycerin	Throbbing headache; pulsation over entire body, dicrotic pulse, flushed face, mental confusion, anxiety, sudden collapse.	Respiratory paralysis.	Recumbent position; cold to head; ergot; atropin.
Nitrohydrochloric Acid.	See *Acid, Nitrohydrochloric.*		
Nitrous Oxid	....	Respiratory paralysis.	Pull tongue forward; air; artificial respiration; douche; oxygen.
Nux vomica. See *St. Ignatius' Bean.*			
Opium Morphin. Narcein. Codein. Laudanum.	Preliminary mental excitement, acceleration of heart; soon headache, weariness, sensation of weight in the limbs, sleepiness, diminished sensibility, contracted pupils; pulse and respirations slow and strong; patient can be roused with difficulty; later this becomes impossible; reflexes abolished, jaw falls; respiration slow, irregular, and stertorous; pulse rapid and feeble.	Respiratory paralysis.	Evacuate stomach; apomorphin; rousing; ammonia; coffee; douche; atropin; amyl nitrite; artificial respiration; external heat; battery; strychnin; potassium permanganate; oxygen.
Oxalic Acid. See *Acid, Oxalic.*			
Papaver somniferum (*Poppy*). See *Opium.*			
Paraldehyd	Similar to chloroform-narcosis	Paralysis of respiratory center.	Respiratory stimulants; coffee; atropin; battery.
Paris Green. See *Arsenic.*			
Peach-kernel—contains *Acid, Hydrocyanic, q. v.*			
Petroleum	Burning in course of alimentary tract; excreta covered with layer of oil; skin cold; pulse feeble, but regular; respiration sighing; thirst; restlessness.	....	Evacuate; stimulants: warmth; stimulation of skin; artificial respiration.
Phenacetin (acetphenetidin)	Very similar to *Antipyrin* and *Antifebrin, q. v.*		
Phenol. See *Acid, Carbolic.*			
Phosphorus	Vomiting and pain; vomit may be luminous in the dark; characteristic odor; after several days deep jaundice, coffee colored vomit, hepatic tenderness, failure in pulse and respiration; coma or delirium; albumin in the urine.	Failure of respiration and circulation.	Sulphate of zinc or copper; Epsom salts; *never give oil or fat.*
Physostigma venenosum (*Calabar Bean*). Eserin.	Giddiness; prostration; loss of power in the lower limbs; muscular twitching; contracted pupils; mind clear.	Asphyxia	Evacuate; atropin; strychnin; stimulants; artificial respiration.

POISONS, TABLE OF.

NAME.	SYMPTOMS OF POISONING.	MODE OF PRODUCING DEATH.	TREATMENT AND ANTIDOTES.
Phytolacca decandra (*Poke*)..	Nausea; vomiting; depression; heart, as well as respiration, slowed; tetanic convulsions.	Paralysis of respiration.	Evacuate; alcohol; opium; ether; digitalis.
Picrotoxin. See *Cocculus.*			
Pilocarpin. See *Jaborandi.*			
Pinkroot. See *Spigelia.*			
Piper cubeba. See *Cubeb.*			
Piscidia erythrin (*Jamaica Dogwood*).	Muscular relaxation; accelerated pulse; lowered sensibility; dilated pupils; deep sleep.	Asphyxia..........	Same as for *Opium, q. v.*
Pituri.........................	Slightly narcotic; powerful respiratory poison.	....	Similar to *Atropin, q. v.*
Plumbago europa (*Toothwort*).	Violent emesis.........................	....	Evacuate; demulcent drinks; heart-stimulants.
Poison-oak. Poison-vine. See *Rhus.*			
Poke-berries. See *Phytolacca.*			
Poppy. See *Opium.*			
Potassium and its compounds.	The hydrate produces the symptoms of other caustic alkalies, *e. g.*, lime; the other poisonous compounds are to be classed under their various acids.	....	*For caustic potash.* Vegetable acids; demulcent drinks.
Potato-fly (*Lytta vittata*). See	*Cantharis.*		
Privet (*Ligustrum vulgare*)...	Purging; intestinal inflammation.........	....	Hot water in large draughts; warmth; stimulants.
Prunus laurocerasus (*Cherry Laurel*). Prunus virginiana (*Wild Cherry*).	Both contain *Acid, Hydrocyanic, q. v.*		
Prussic Acid. See *Acid, Hydr*	*ocyanic.*		
Ptomains. See *Meat.*			
Pulsatilla...................	Lowers heart's action, reduces respiration and temperature; dilates pupils; paralyzes motion and sensibility.	Paralysis of heart..	Alcohol; opium; digitalis.
Pyrogallic Acid. See *Acid,*	*Pyrogallic.*		
Resorcin...................	Giddiness, tingling; insensibility, profuse perspiration; tongue dry; pupils normal; teeth clenched, temperature low; urine black.	Paralysis of respiration.	Evacuate; albumin; stimulants; warmth; atropin; amyl nitrite; red wine.
Rhus radicans (*Poison-vine*).. Rhus toxicodendron (*Poison-oak*).	Cutaneous irritation; itching, swelling, vesicular eruption; may involve the throat, producing cough; thirst, vomiting, colicky pains, fever, delirium.	....	Grindelia robusta locally; also carron-oil and solution of acetate of lead; also phenol 5 percent. solution or cocain 5 percent. solution or ichthyol; rest; low diet; laxatives; opium.
Ricinus communis (*Castor-oil*).	Burning, nausea, vomiting, colicky pains, small pulse, great prostration; purging may or may not occur.	....	Evacuate; morphin, hypodermatically; warmth; stimulants; starch and opium enemata.
Rue....................... Ruta graveolens (*Rue*).	Violent gastroenteritis, extreme prostration, convulsions, strangury, suppression of urine.	....	Evacuate; demulcent drinks; diuretics; heart stimulants.
Salicylic Acid. See *Acid,*	*Salicylic.*		

POISONS, TABLE OF.

NAME.	SYMPTOMS OF POISONING.	MODE OF PRODUCING DEATH.	TREATMENT AND ANTIDOTES.
Saliva of Rabid Animals	Rarely come on in less than three weeks; may occur between that and years; pain in the bitten part; uneasiness, languor, difficult respiration, difficulty in swallowing, horror of water; violent convulsions; tongue swollen and often protruding; flow of viscid saliva.		*Preventive:* Immediate ligature above wound; excision; cautery; inoculation. *Of hydrophobia:* Chloroform internally; morphin hypodermatically; cocain to throat; nutritive enemata.
Sambucus canadensis (*Elder*).	Emesis; purging		Demulcent drinks; evacuate.
Sanguinaria canadensis (*Bloodroot*).	Salivation, catharsis, and vomiting, reflexes lowered; pupils dilated; temperature low; great thirst; collapse.	Paralysis of the cardiac and respiratory centers.	Evacuate; opium; amyl nitrite; atropin.
Santonin	Disturbance of color-vision—objects first assume a bluish tinge, then yellow; tinnitus; dizziness; pain in the abdomen; failure of respiration; convulsions; stupor.	Asphyxia	Evacuate; stimulants; chloral.
Savin	Pain, vomiting, tenesmus, and bloody stools; disordered respirations; coma, and convulsions.		Evacuate stomach; castor-oil in large dose; morphin; poultices to the abdomen.
Scammony	Vomiting, purging, griping, tenesmus		Evacuate; stimulants.
Scilla maritima (*Squill*)	Vomiting, purging, strangury, bloody urine, paralysis, and convulsions.	Paralysis of heart in systole.	Evacuate; demulcent drinks; diuretics; stimulants.
Secale cornutum. See *Ergot*.			
Silver and its salts	Pain, vomiting, and purging; vomit white and cheesy, rapidly turning black in the sunlight; vertigo, coma, convulsions, paralysis, and marked disturbance of respiration.	Paralysis of respiration.	Salt and water; evacuate stomach; a large amount of milk; albumin.
Snake-bite. (The bite of many varieties of serpents is directly poisonous.)	Vary in severity, but are, in the main, sharp pain in the bitten part, rapidly spreading; great swelling of the wounded member, which becomes livid and gangrenous later; fainting, vomiting, and convulsions; pulse small, frequent, and irregular; breathing difficult.	Paralysis of cardiac and respiratory centers.	Removal of poison by sucking or cupping; ligature above wound; cautery or excision; ammonia to wound and internally; warmth; in some cases large doses of ammonia or whisky internally; transfusion of blood.
Soda (Sodium)	Symptoms and treatment similar to those of other caustic alkalies, as *Lime*, *q. v.*		
Solanum dulcamara (*Bittersweet*).	Thirst, headache, giddiness, dimness of vision, dilated pupils, convulsions, vomiting, purging.	Asphyxia	Evacuate; stimulants; warmth.
Sorbus acuparia (*Mountain Ash*).			Same as for *Opium*, *q. v.*
Spanish Fly. See *Cantharis*.			
Spigelia marilandica (*Pinkroot*).	Vertigo, dimness of vision, dilated pupils, spasms, convulsions; delirium; dryness of throat.		Evacuate; stimulants; coffee.
Squill. See *Scilla*.			
Stalagmitis cambogioides. See	*Gamboge*.		
Staphisagria	Heart slow and feeble; breathing difficult; pupils dilated; abdomen distended and painful.	Paralysis of spinal cord and asphyxia.	Cardiac and respiratory stimulants.
Stavesacre. See *Staphisagria*.			
Stramonium. See *Datura*.			
Strophanthus (*Arrow-poison*). Strophanthin.	Weakness of pulse; increase of urine, rigidity of the muscles; spasms.	Paralysis of the heart in systole.	Cardiac stimulants.

POISONS, TABLE OF.

Name.	Symptoms of Poisoning.	Mode of Producing Death.	Treatment and Antidotes.
St. Ignatius Bean. Strychnos ignatia. Strychnos nux vomica (*Nux vomica*). Nux vomica. Strychnin. Brucin.	Tetanic convulsions coming on in paroxysms at varying intervals of from five minutes to half an hour; opisthotonos during paroxysm; eyeballs prominent; pupils dilated, respiration impeded, pulse feeble and rapid; anxiety.	Asphyxia during paroxysm, or collapse.	Evacuate stomach; tannic acid ad lib.; follow with emetic; catheterize; keep patient quiet; bromids and chloral; amyl nitrite or chloroform to control convulsions; artificial respiration if indicated.
Sulphonal	Giddiness, weakness, ptosis, cyanosis, suppression of urine.		Stimulants; diuretics.
Sulphuric Acid. See *Acid, Sulphuric.*			
Sumach. See *Rhus.*			
Tanacetum vulgare (*Tansy*). Tansy.	Convulsions, insensibility, dilated pupils, respirations hurried and stertorous; pulse full, gradually failing; characteristic odor of breath.	Heart-paralysis.	Heart-stimulants; evacuate.
Tartar Emetic. See *Antimony.*			
Tartaric Acid. See *Acid, Tartaric.*			
Tin	Metallic taste, vomiting, and diarrhea; pain; depressed action of heart.		Evacuate; magnesium; mucilaginous drinks.
Tobacco. Nicotin.	Nausea, vomiting, weakness, weak pulse, cold and clammy skin, collapse, pupils contracted, then dilated.	Paralysis of respiration; sometimes paralysis of heart.	Evacuate stomach; tannic acid; strychnin; stimulants; warmth; recumbent position.
Truffles. See *Fungi.*			
Turpentine	Characteristic odor; intoxication; contracted pupils; stertorous breathing; coma; collapse; tetanic convulsions; the urine has the odor of violets.	Paralysis of respiration.	Evacuate; magnesium sulphate; demulcent drinks; morphin.
Tyrotoxicon	Nausea, vomiting, cramps, diarrhea, collapse.		Evacuate; intestinal antiseptics.
Urethan	Vomiting; slowing of heart; temperature lowered; muscular resolution and general anesthesia.	Asphyxia.	Evacuate; cardiac stimulants.
Vaselin	Cramps in lower limbs, severe and persistent vomiting; collapse.		Evacuate; stimulants.
Veratrum album (*White Hellebore*). Veratrum viride (*Green Hellebore*).	Burning and pain in course of alimentary tract; inability to swallow; vomiting and diarrhea; palpitation; slow, weak pulse; respiration labored; pupils generally dilated; may be convulsions.	Paralysis of respiratory centers.	Evacuate stomach; ether hypodermatically; opium; stimulants; coffee; warmth; recumbent position.
Verdigris. See *Copper.*			
Wild Cherry. See *Prunus.*			
Wintergreen. See *Gaultheria.*			
Woorara. See *Curare.*			
Yew	Vomiting and delirium; pain in abdomen; irregularity of the heart's action; death may be sudden.		Evacuate; quick purgation; stimulants.
Zea mays (*Maize*)	Slow heart; dilated pupils; tonic convulsions.	Tetanus of respiratory muscles, or exhaustion.	Cardiac and respiratory stimulants.
Zinc	Corrosion of lips or mouth; pain and burning; incessant vomiting, the vomit blood-stained; acceleration of pulse and respiration; dyspnea; dilatation of the pupils; epileptiform convulsions; paralysis; coma.		Sodium or potassium carbonate; milk; eggs; tannic or gallic acid; morphin hypodermatically; poultices to abdomen.

Household Antidotes.—When the other articles to be used as antidotes are not in the house, give 2 tablespoonfuls of prepared mustard in a pint of warm water. Also give large drafts of warm milk, or water mixed with oil, butter, or lard.

For bed-bug poison, For corrosive sublimate, For blue vitriol, For lead-water, For saltpeter, For sugar of lead, For sulphate of zinc, For red precipitate, For vermilion,	Give milk or white of eggs, large quantities.
For Fowler's solution, For white precipitate, For arsenic,	Give prompt emetic of mustard and salt, tablespoonful of each; follow with sweet oil, butter, or milk.
For antimonial wine, For tartar emetic,	Drink warm water to encourage vomiting. If vomiting does not stop, give a grain of opium in water.
For oil of vitriol, For aquafortis, For bicarbonate of potassium, For muriatic acid, For oxalic acid,	Magnesia or soap dissolved in water, every 2 minutes.
For caustic soda, For caustic potash, For volatile alkali,	Drink freely of water with vinegar or lemon-juice in it.
For carbolic acid,	Give flour and water, glutinous drinks, and a form of alcohol.
For chloral hydrate, For chloroform,	Pour cold water over the head and face, with artificial respiration, galvanic battery.
For carbonate of sodium, For copperas, For cobalt,	Prompt emetics; soap or mucilaginous drinks.
For laudanum, For morphin, For opium,	Strong coffee followed by ground mustard or grease in warm water to produce vomiting. Keep in motion.
For nitrate of silver,	Give common salt in water.
For strychnin, For tincture of nux vomica,	Emetic of mustard or sulphate of zinc, aided by warm water.
For iodin and iodids,	Prompt emetic; solution of starch; flour and water.

POISONING, MEDICOLEGAL DUTIES IN FATAL CASES.—The duties of the medical examiner are:

1. To establish the presence or absence of conditions characteristic of any poison.

2. To preserve all necessary material for analysis, taking care that nothing thereby is done to introduce causes of error.

3. To recognize or exclude natural causes of death.

4. If necessary, to perform experiments upon animals to demonstrate the toxic effect of substances separated by the chemist.

5. To record carefully all personal observations and to state clearly the conclusions as to the cause of death.

Information as to the circumstances of the death, while guiding the medical examiner in his mode of proceeding, must not bias his scientific opinion.

The most difficult cases are those in which the postmortem appearances are negative or consistent either with disease or poison. In these, however, the postmortem evidence, though necessary, is only of indirect value. Want of harmony between the clinical, anatomic, and chemic evidence is a most serious obstacle to a decisive result in court, and witnesses for the prosecution are sometimes singularly blind to very obvious defects of this kind in State evidence. The scientific value of medical opinion in poisoning cases has been considerably overrated in the past, and when its limitations have become more clearly recognized on all sides, the present undignified conflict of scientific opinion in court will probably become a thing of the past. Overpositiveness is the root of nearly all evil in medical testimony.

In any medicolegal autopsies with negative results, poisoning should be borne in mind, and the necessary materials preserved until the case is cleared up, in case an analysis may be necessary. Finding of an immediate cause of death of another nature does not always exclude poisoning. For instance, a man may be drugged previous to a fatal assault, or the death of a sick person hastened by poison.

In making a report, after fully stating all facts established by the autopsy, but without introducing extraneous circumstances, the conclusions should be concisely drawn up. These should be limited to what is proved by the report beyond contradiction, and may usually be expressed in one or other of the following formulas:

1. The autopsy does not show cause of death. To determine whether poisoning has occurred, an analysis will be necessary.

2. Conditions found are *characteristic* of poisoning by . . . .

3. Conditions found *are consistent with* poisoning by . . . . (or *are not consistent*).

4. Death is due to. . . (natural cause), poisoning by. . . . . is *excluded* (or *not excluded*, or *not demonstrated*).

Preliminaries.—The following general precautions are to be observed: The autopsy should be done by two medical men, with some one to take notes. Persons suspected must not be present at the autopsy, but may be represented. The identity of the body should be carefully established. In exhumations the pathologist should be present when the coffin is opened, and samples of soil above and below the coffin should be taken. Linings or shavings within the coffin, if soaked with fluid from body, should be preserved. Provide a sufficient number of clean new glass jars (the "gem" jar pattern will answer)—at least a dozen should be available. Materials for analysis should be kept under personal supervision and delivered by hand to the chemist—not sent by mail or express. Provide facilities for examining the organs without contact with substances which would interfere with chemic analysis. If new and clean porcelain dishes are not available, pieces of freshly sawed boards will answer. Decomposition is best prevented by freezing the organs. If available, a cold-storage chamber is best. When absolutely necessary to prevent decomposition, pure alcohol is recommended, a control sample being reserved for analysis (probably formalin will prove a better preservative, but its possible influence on the results of analysis is not yet known). A sample of the jar used should be kept. The jars are to be sealed by attaching tape to both jar and cover by means of sealing-wax, the seal being retained. Jars containing decomposing tissues should be loosely stoppered to prevent bursting. A signed and dated label should be placed on each jar. By knowing the tare weight of the jars, or by using a counterpoise, organs may be weighed while in the jars.

The autopsy should be made as soon after death as possible, but preferably not by artificial light. The modern undertaker's fondness for embalming bodies is a serious inconvenience, but, fortunately, the arsenical preparations are being superseded by formalin. In some States legislative restrictions specifically forbid the embalming of bodies pending judicial inquiry.

Poisons introduced after death may diffuse through the tissues and enter remote organs, though most concentrated at point of insertion. The compounds formed by rapid putrefaction at high temperatures are less likely to be confused with alkaloidal poisons than those slowly formed at low temperature.

When practicable, the chemist may, with advantage, be present at the autopsy, but unless he is personally accustomed to postmortem work, the results of this assistance may be disappointing. Want of familiarity with ordinary cadaveric odors interferes much with the recognition of those characteristics of volatile poisons. On the other hand, the pathologist should be present at the opening and examination of the stomach and intestines if this is done by the chemist.

Technic. External Examination.—The surroundings of the body may give important information. Any substances which might contain poison found in the vicinity should be seized and preserved; the surface of the body should be examined for traces of corrosion or evidences of poison spilt. The mouth, lips, and tongue need careful examination, and the whole surface should be examined for hypodermic punctures. At all stages of the autopsy characteristic odors should be watched for. These may be masked by the odor from intestines, and hence may be best detected in the brain before the other cavities are opened. In a well-equipped laboratory facilities for making preliminary tests should be at hand.

Internal Examination.—Authorities differ as to the best order for examination of the organs. In Germany official regulations insist on the ligation and removal of the stomach and duodenum as the first step in the autopsy, to be done before opening the thorax. This has the advantage of interrupting the continuity between esophagus and stomach. French authorities insist strongly on the preservation of the blood for analysis of the dissolved gases, also on the separate preservation of the urinary organs, as in these alkaloids are found in the greatest state of purity. American toxicologists lay stress—and that rightly—upon large quantities of the tissues being preserved, and, especially in chronic poisoning, of analysis of large quantities of muscle and bone. Witthaus advises preserving, in separate jars, (1) the stomach and duodenum and contents, ligated and unopened; (2) the rest of the intestine and contents, ligated and unopened; (3) the entire liver; (4) the blood from the heart and vessels; (5) both kidneys; (6) the urine; (7) the entire brain; (8) a large piece of muscle from the thigh; portions of the bones and spleen may also be taken with advantage. Fairly satisfactory analyses, however, may be made with amounts considerably less. If only a few jars are available, group together (1) stomach and intestine with contents; (2) liver; (3) brain, blood, spleen, and kidneys, etc.; (4) bone or muscle. When the autopsy is done under very unfavorable surroundings, it may be safer simply to eviscerate all the organs, placing them in a large enamel vessel for immediate transport to the laboratory.

Proof of poisoning has been established by chemists by analysis of muscles or one kidney, when all the other tissues have been removed and got rid of by the suspected parties.

Important information as to the time of absorption is shown by the distribution of poisons in the various tissues. The unabsorbed residue is found in the stomach and intestines, plus whatever may have been excreted by the intestines. Poisons in both stomach and liver indicate a short interval between the taking and the death. Poison in the liver and organs, with none in the stomach, indicates a greater interval if the poison was taken by mouth. Most poisons remain in the liver after disappearance from the stomach, and remain longer in the muscles and bones than in any other tissue. Poisons are found in their greatest purity in the kidneys and urine. When chronic poisoning is suspected during life, a sample of urine may be quietly secured for analysis without arousing suspicion. Apart from the analysis, the stomach contents give valuable information as to the time and composition of the last meal, which may have a very important and circumstantial bearing.

In corrosive poisoning, the best results are obtained by removing the mouth, esophagus, stomach, and duodenum together. The fauces and pharynx, besides corrosion, may show foreign substances, and any particle between the teeth should be carefully examined. The crucial point of the autopsy is the opening and examination of the stomach, which should be done over a vessel suitable for receiving the contents, the mucous membrane being spread out and examined with a hand lens for lesions and suspicious substances. The cooperation and presence of the chemist at this stage is specially valuable, but the examination of the stomach by the chemist alone may lead to statements very extraordinary from a pathologic point of view.

For analysis of contained gases in blood, the bottles should be completely filled and tightly stoppered.

It must be remembered that besides the examination for poisons and their lesions, every organ must be thoroughly examined and all natural causes of death, in particular the causes of sudden death, rigidly excluded. Particular attention must be paid, therefore, to the cerebral, pulmonary, and coronary arteries, the veins and other sources of embolism, the heart-muscle, brain, and the air-passages.

In addition no examination should be neglected which will forestall subsequent hypothetic objections, the spinal cord being best examined as part of the routine. It is most necessary that microscopic and bacteriologic studies be made when these will yield any information. Small bits of tissue preserved in formalin for microscopic examination will often give decisive information in organs too decomposed to be trustworthy to the naked eye.

Sources of Error.—The principal are: (1) Failure to recognize the existing appearances of poisoning; (2) supposed detection of characteristic appearances not really present; (3) misinterpreting, as effects of poison, lesions due to disease or to agonal or postmortem changes. In acute cases the possibility of remedial measures employed in modifying appearances must be borne in mind. The inflamed and reddened conditions of the stomach recorded for many poisons, are probably largely mistakes of observation.

The stomach in full digestion is found intensely reddened postmortem. Softening of the mucosa after death may resemble erosion, and passive or hypostatic congestion may lead to suffusion of blood in the mucous membrane, with the appearances strongly resembling those in inflammation. Due allowance must be made for the attitude of the mind when certain changes are expected. To pathologists, reddening or congestion of the stomach mucosa in itself indicates nothing important.

Anatomic Distribution of Lesions.—The following are some of the more common changes:

Surface.—Pinkish lividity, from carbon monoxid or cyanid of potassium.

Fauces, Esophagus, and Stomach.—Foreign substances, corrosion effects, odors, inflammatory exudates, ulcers, and perforation; brittleness from acids; soapiness from alkalies. The microscopic examination of sloughs shows hemorrhagic infiltration at the base, and may show crystals, as arsenic or oxalates. Diluted corrosives cause more inflammation, but less necrosis, than concentrated ones. The stomach lesions lie mostly at the greater curvature and along the rugæ. Among foreign substances, may be found match-heads, indicating phosphorus; cantharides scales, Paris-green particles, etc. Fatty change following cloudy swelling may occur secondarily in arsenic and phosphorus-poisoning.

Intestines.—Diffuse pinkish congestion, with rice-water contents in arsenic poisoning, and membranous colitis in sublimate poisoning, are highly characteristic.

Blood.—Carmin colored in poisoning by carbon monoxid and potassium cyanid; dark in prussic acid poisoning; chocolate brown, with destruction of red cells, from potassium chlorate and other reducing agents; dark, and free from clots in alcoholic or narcotic poisoning, and all conditions causing death by asphyxia. Distinctive odors may be present.

Heart.—Fatty in subacute arsenic and phosphorus-poisoning; ecchymoses of walls with phosphorus-, and subendocardial ecchymoses with arsenic, poisoning.

Lungs.—Congestion and bronchopneumonia from narcotics; carmin colored and edematous in carbon monoxid; fat emboli with phosphorus.

Kidneys.—Cyanosed in alcoholism, with the hog-back shape; cloudy swelling and fatty change in arsenic and phosphorus; congestion and glomerular and papillary hemorrhages in cantharides; methemoglobin infarcts with potassium chlorate, etc.

Liver.—Fatty with arsenic and phosphorus-jaundice in phosphorus.

Lesions Characteristic of the More Important Poisons. Concentrated Sulphuric Acid.—Blackening from carbonization in esophagus, stomach, and duodenum; perforation and charring of adjacent organs; erosion of skin.

Dilute Sulphuric Acid.—Severe gastroenteritis, with sloughing and ulceration.

Hydrochloric Acid.—Concentrated: corrosion, with gray color of the stomach; no corrosion of skin. Dilute: same as dilute sulphuric.

Nitric Acid.—Intense yellow tint from the formation of picric acid, tissues becoming very brittle.

Caustic Alkalies.—Mucosa of mouth, esophagus, and stomach swollen, translucent, and brown, soapy to the touch, and with odor of lye. In later stages intense inflammation of stomach and esophagus (croupous in the case of ammonia), followed by ulceration. Stricture of esophagus frequently follows.

Nitrous Acid Fumes.—Intense capillary bronchitis, with edema of lungs.

Corrosive Sublimate.—Severe gastroenteric with diphtheritic colitis and very marked cloudy swelling of the kidney.

Arsenous Acid.—Intense congestion and hemorrhage of stomach; diffuse pinkish congestion of small intestines, with rice-water contents, free from fetor. Subendocardial ecchymoses. In later stages, necrosis and fatty change in stomach, cloudy swelling and fatty change of kidneys, skin eruptions, and neuritis in chronic cases.

Antimony Tartrate.—In acute cases general appearances similar to arsenic; in addition sometimes pustular eruption where tissues are in contact with the solid particles, as in esophagus; greater tendency to engorgement of lungs with pulmonary apoplexy.

Silver Nitrate.—Whitish coagulum, blackening on exposure to light; blackening of skin and internal organs in chronic poisoning (very rare).

Copper Salts.—Blue discoloration and tan appearance of tissues.

Lead.—In chronic cases blue line of gums, with fibrosis of the organs and nerves (changes not constant).

Carbolic Acid.—Corrosion, with drying, hardening, and whitening of tissues; characteristic odor; stomach pinkish-gray; blood, in contact, brick-red; lungs engorged.

Oxalic Acid.—Whitish coagulation of mucosa at point of contact; severe inflammation and hemorrhage about corroded areas, if death is not immediate; infiltration of tissues by octahedral oxalate crystals.

Phosphorus.—Sometimes luminosity of stomach contents; presence of match-heads, onion odor, intense jaundice, fatty degeneration of liver, kidneys, and heart; ecchymoses throughout entire body; fat embolism. In chronic forms necrosis of jaw.

Carbon Monoxid.—Bright red lividity of surface. Carmin color of blood, with persistent fluidity and characteristic spectrum. Pinkish appearance of organ from alteration in blood tint. Edema of lungs; asphyctic state, with engorgement of organs. Delayed decomposition. Color of blood unaltered on adding alkalies, tannic acid, etc.

Hydrocyanic Acid.—Asphyctic state; characteristic odor (masked in presence of ammoniacal decomposition). Blood becomes bright red on adding reducing agent.

Cyanid of Potassium.—Asphyctic state; odor as in prussic acid; blood lake-colored. Mucosa of esophagus and stomach brownish-red, swollen, thrown into folds, translucent, and slippery.

Nitrobenzol.—Intense cyanosis; odor of bitter almonds.

Potassium Chlorate.—Cyanosis and asphyxia; chocolate-brown color of blood and organs, with methemoglobin spectrum; acute hemorrhagic glomerulonephritis, with methemoglobin in kidneys, spleen, bone-marrow, and urine.

Potassium Bichromate.—Changes similar to those from potassium chlorate; decomposition delayed.

Hydrogen Sulphid.—Characteristic odor; greenish tint of blood (only found in animal experiments).

Alcohol.—Characteristic odor, specially marked in brain and liver; odor may be that of aldehyd, ether, or mercaptan. Asphyxia, engorgement of organs with blood, edema of glottis, lungs, and pia. The organs usually present stigmata of chronic alcoholism—viz., cyanotic (hog-back) kidneys, with diffuse cirrhosis; fatty or cirrhotic liver, milky opacity of pia, and chronic or acute gastritis.

Cantharides.—Inflammation of stomach and intestine, with presence of scales in the stomach; acute hemorrhagic glomerulonephritis, hemorrhagic pyelitis, and hematuria.

The following poisons have appearances which, while fairly constant and uniform, are not in themselves characteristic:

Morphin, Laudanum, Chloral, and Narcotics.—Intense cyanosis and congestion of organs, frequently bronchitis and commencing hypostatic pneumonia.

In poisoning from **strychnin, belladonna, and other alkaloids, and in most glucosids,** the postmortem conditions indicate death by asphyxia. It must be mentioned, also, that this condition is found in poisons which produce syncopal effects, such as aconite, etc., the anatomic condition described as characteristic of syncope being only a figment of medicolegal imagination. With poisoning from digitalin and ptomains diarrhea is often a prominent symptom, without inflammatory changes in the intestines.

Anesthetics.—In deaths during anesthesia the appearances are usually negative; accidental causes of suffocation should be carefully looked for, as well as evidences of organic disease. Suffocation by inhalation of vomited matters is very frequently the immediate cause of death in alcoholism and carbon monoxid poisons, and occasionally is so in other poisons.

The recent work showing that ricin, abrin, and other substances produce cell-necrosis in the liver and kidney, indicates a field in which investigation is needed, and might give valuable diagnostic results. The leukocytosis in arsenic and other poisons may prove of importance in the future. The swelling and hemorrhagic condition characteristic of snake-venom, and the cell changes produced by the bacterial toxins, have important bearings on toxicology. So also has the rôle which secondary bacterial infection plays in poisoning cases, though as yet data on this are too meager to permit of generalization.

In the foregoing article prominence has not been given to the minor technic details of autopsy routine. Those who are not thoroughly familiar with autopsy methods will probably serve best their own interests and those of the public by not attempting work of this kind. When such a person cannot avoid the responsibility, his best plan would be to remove all the organs with as little dissection as possible, and bring them, untouched and uncontaminated, into the hands of some more competent person.

POLIENCEPHALITIS.—See Brain (Inflammation).

POLIOMYELITIS, ACUTE ANTERIOR.—See Paralysis (Infantile).

POLIOMYELITIS, ACUTE IN ADULTS (*Acute Atrophic Spinal Paralysis of Adults*).—Very rarely in adults under 30 occurs a disease almost identical with the infantile form, though mistakes in diagnosis have been made, the disease being in reality multiple neuritis.

POLIOMYELITIS, SUBACUTE AND CHRONIC (*General Anterior Spinal Paralysis, Subacute of Duchenne, Subacute and Atrophic Spinal Paralysis*).—Cases have occurred, though rarely, characterized by paralysis and atrophy of all extremities without sensory disturbance, and without the severe onset of the acute form. It has often been mistaken for multiple neuritis.

POLITZERIZATION.—See Ear (Examination).

POLLANTIN (Dunbar's Serum).—An antitoxic serum from horses treated with pollen toxin derived from ragweed. It is used in the prophylaxis and treatment of hay fever. See Serum Therapy.

POLYCYTHEMIA.—Marked increase in the red blood cells is generally indicative merely of concentrated blood or stasis. It occurs in health after bathing, massage, violent exercise. It is observed in high altitudes and follows the administration of certain drugs. It may occur during digestion, in blood regeneration, vomiting, profuse sweating, the removal of exudates, profuse diarrheas and, it is said, with myxedema and acute yellow atrophy. It is found in circulatory derangements, such as organic heart disease, emphysema, stenotic dyspnea. See BLOOD.

POLYDIPSIA.—Excessive thirst. It is usually present in fevers and in diabetes. See THIRST.

POLYNEURITIS.—See NEURITIS (Multiple).

POLYPUS.—A pedunculated tumor arising from mucous membranes. The nose is a frequent seat of polypi. Uterine polypi are of three kinds—cystic, derived from the ovules of Naboth; mucous or soft, resembling rectal polypi; and hard or fibrous, the so-called fibrous polypus of the uterus. Polypi of the ear resemble nasal polypi, springing from the tympanic membrane and from the interior of the tympanum. Intestinal polypi are of more frequent occurrence in the rectum than in any other portion of the intestinal tract. They are composed of tissue resembling that of the mucous membrane of the part, and are mostly described as adenomata. Polypi are also found in the bladder, larynx, on the gums, and sometimes in sinuses communicating with the nose. See NOSE, UTERUS.

POLYURIA.—Excessive secretion of urine. The causes of temporary polyuria are: excessive ingestion of fluids, cold, suppression of perspiration, the use of diuretics; it occurs in the crisis of fevers, and in certain neurotic conditions, as hysteria, and in nervous excitement. A permanent polyuria is met in diabetes mellitus, diabetes insipidus, chronic interstitial nephritis, and in amyloid disease of the kidneys. See DIABETES, NEPHRITIS, URINE (Examination).

POMEGRANATE.—See GRANATUM.

POMPHOLYX.—A rare inflammation of the hands and feet generally of the palmar and plantar surface, resulting in the formation of vesicles and blebs, occurring in adults. The majority of cases are met with in neurotic women. The vesicles are deep-seated and resemble boiled sago grains; they may disappear by absorption or become purulent or coalesce to form large, flat blebs. The disease is usually symmetric and lasts from a few weeks to several months. It must not be confounded with eczema or rhus poisoning. Treatment consists in improving the general health by tonics and good food and keeping the bowels open. Soothing applications are indicated locally.

PONS, DISEASES.—**Tumors** of the pons produce symptoms chiefly of pressure. Of 52 cases, 13 had cerebral nerves involved, in 13 the limbs were affected, and in 26 hemiplegia and nerve involvement existed. Twenty-two of the latter had alternate paralysis. In 4 no motor symptoms presented.

Hemorrhage into the pons and medulla oblongata is rarer than cerebral hemorrhage and more frequent than hemorrhage into the spinal cord. Atheroma or miliary aneurysm and other factors productive of increased arterial tension are usually coincident, while cardiac hypertrophy, nephritis, excessive bodily exertion, and alcoholism may be traced.

Lesions involving the pyramidal tract cause crossed paralyses. A lesion in the lower part of the pons will cause a lower segment paralysis of the face on the same side, and a spastic paralysis of the arm and leg on the opposite side. The abducens, the motor part of the trigeminal, and the hypoglossal nerves may likewise be paralyzed. When the central fibers to the nucleus of the hypoglossus are involved, a peculiar form of anarthria follows. Swallowing is interfered with if the nucleus itself is involved. A paralysis of the external rectus muscle of one eye and of the internal rectus of the other eye, in the absence of a "forced position" of the eye-balls, is highly characteristic of certain lesions of the pons. The internal rectus may still be capable of convergence. This conjugate paralysis may be complicated by other disturbances of eye-muscle movements, and the facial nerve is often involved in these paralyses.

In lesions of the pons the patient has a tendency to fall to the side on which the lesion is situated. Still more frequent is the simple motor hemiataxia consequent upon lesion of the medial lemniscus and possibly the longitudinal bundles in the formatio reticularis. Only when the lesions are very extensive are there disturbances of hearing.

Treatment should conform to that of cerebral hemorrhage. Electricity is indicated for the paralysis.

POPLITEAL ANEURYSM.—The popliteal artery is the most common seat of aneurysm, except the aorta itself. It is peculiarly liable to atheroma; it is not supported by the structures around; it is compressed more or less in flexion of the knee, stretched out in overextension, sometimes even ruptured; and immediately below it breaks up into a number of branches, so that an embolus, if it comes down the vessel, is almost certain to lodge there. That constitutional causes are of very great importance is shown by the fact that it sometimes occurs on both sides, and that it may even develop upon the second while the patient is lying in bed being treated for the first. Fusiform dilatation occasionally occurs, but sacculated aneurysm is much more common. In some cases it springs from the anterior surface of the artery and grows forward against the bone or the posterior ligament of the knee-joint, and then it is usually slow in its course, rarely attaining a large size. In others it extends backward, and, meeting with little to oppose it, becomes immense, forming a thin-walled sac within a comparatively short space of time.

Symptoms.—Occasionally the onset is sudden, dating from some exertion; more frequently, the patient suffers from obscure rheumatic pain down the leg, with stiffness of the joint and sense of weakness, and then suddenly discovers, or has discovered for him, the presence of a pulsating swelling. Usually the expansive pulsation, the bruit conducted down the leg, and the way in which the sac empties upon compression and fills again on relaxation of the vessel are distinctive. Occasionally the tumor is harder and cannot be emptied, the pulsation is that of an artery only, and the bruit is indistinct and faint; and in some very rare instances there is no pulsation at all. Probably, in the former case, the sac is already partly filled with fibrin, and possibly in the latter it is completely solid; but as pulsation sometimes makes its appearance later, this explanation is hardly satisfactory. If the sac grows forward, synovitis of the knee-joint sets in, the pain is very severe, and movement greatly restricted. If it takes a direction backward, the popliteal vein may be compressed and congestion and edema follow; or the internal popliteal nerve may be stretched so that there is severe neuralgia extending down the side of the limb into the sole of the foot. Sometimes a distinct difference can be made out in the two tibial pulses.

Left to itself it occasionally undergoes spontaneous cure. Much more frequently it grows larger and larger, leaks, and ruptures either into the knee-joint, or more usually into the cellular tissue of the leg. In either case the patient is conscious of something having given way, and becomes sick and faint with the pain and loss of blood. If the rupture takes place through the posterior ligament, the knee becomes immensely distended at once, but the bruit and pulsation do not cease altogether, and the pulse can still be felt, though feebly, in the posterior tibial. If it is into the cellular tissue, a tense swelling forms rapidly in the popliteal space, filling it completely and causing the most severe pain; the limb below becomes cold and livid, the tibials cannot be felt, and in a very short time gangrene sets in. Occasionally inflammation breaks out round the sac, the skin becomes red, edematous, and exceedingly painful, and sometimes this is followed by suppuration.

The differential diagnosis must be made from sarcoma growing either from the bones, the posterior ligament of the knee-joint, or the lymphatic glands; abscess; bursal cyst, or diverticulum from the knee-joint; and solid tumors resting upon the artery. Arterial hematoma from perforation of the popliteal artery gives rise to the same symptoms as a leaking or a ruptured aneurysm, according to the size of the opening. Sometimes there is a distinct bruit with faint pulsation along the course of the vessel.

Treatment.—Rest and diet are employed only as adjuncts, but they should never be neglected, and unless the sac is enlarging rapidly, so that there is fear of rupture, it is always advisable to submit the patient to a few days' preparation before employing any active treatment. If the aneurysm is of moderate size only, and there is no fear of immediate rupture, Reid's method with Esmarch's bandage, or digital compression, is the best, preference being given to the latter if there is much evidence of atheroma or of heart-disease; to the former if, other things being suitable, there are enlarged glands in the groin. Flexion succeeds well with aneurysms that are small or already partially solidified. If these measures fail, or if the sac is enlarging rapidly and perhaps leaking, or if inflammation has set in, or if there is any edema of the foot from pressure upon the popliteal vein, surgical treatment should be resorted to. Matas' operation of aneurysmorrhaphy has been practised with success in popliteal aneurysm, and is to be preferred to ligation of the femoral artery. See ANEURYSM.

POPPY.—See OPIUM.

POSITIONS.—See FETUS (Positions and Presentations.)

POSTMORTEM EXAMINATION.—The general technic of a postmortem is as follows: First, the appearance of the body is described, including sex, height, apparent age, discoloration of the skin, rigor mortis, state of the nutrition, injuries, deformities, and any peculiarities that may be observed.

An incision is then made from the top of the sternum to the pubic symphysis, the abdomen being the cavity first opened. Then the position of the viscera, their condition, the presence of hernia, if it exists, the state of the peritoneum, and the quantity of fluid are noted, but all without disturbing the relation of the contents. The thorax is now opened. In order to do this, the ribs are divided at the costochondral junction, and the sternum and clavicles disarticulated. The relation of the structures exposed on lifting up the separated portion of sternum and ribs is noted—the presence of fluid in the pleural cavity, pleural adhesions, the extent to which the lung covers the pericardium. The pericardial sac is next opened, and its condition and the quantity of fluid recorded.

The opening of the heart is the next step. This may be done in several ways; one of the best is Virchow's method. The heart is opened *in situ*. The first incision is made in the right ventricle (many open the right auricle first), along the ventricular ridge, from near the auriculoventricular groove to near the apex. The second incision opens the right auricle midway between the entrances of the venæ cavæ. In the left auricle the incision is carried from the left superior pulmonary vein to near the auriculoventricular ring. The incision through the left ventricle begins just behind the base and ends just short of the apex. It must be carried deeply through the wall of the heart. The heart is now removed. To do this the organ is grasped with the index-finger of the left hand in the left ventricle and the thumb in the right; the heart is then raised by the apex and the venæ cavæ, the pulmonary veins, and the pulmonary artery, and the aorta divided, taking care that the incisions are not too close to the heart. The next step is to open the ventricles. For this purpose the heart is placed exactly in the position it occupied in the body. One blade of the scissors is then introduced near the lower end of the incision in the right ventricle, and carried outward in the direction of the pulmonary artery. The incision for the left ventricle commences at the apex of the heart and divides the anterior wall of the ventricle close to the septum, and is continued outward.

The lungs are next removed, usually the left first. Section of these organs is made by a long sweep of the knife—in the case of the left preferably from the apex to the base; in the case of the right, from the base to the apex. Attention is now directed to the abdomen, the **spleen** being the first organ removed.

Next come the **suprarenals** and the **kidneys.** In order to gain access to these it is wise to dissect off, by a few quick cuts, the entire colon from the sigmoid flexure to the ileocecal valve. A double ligature is placed around the sigmoid, and the gut divided between the ligatures. The removal of the kidneys is further facilitated by cutting the diaphragm loose from its costal attachments and throwing it upward, with the liver, into the thoracic cavity. The adrenals and kidneys are then exposed; the course and condition of the ureters are noted. The suprarenals may now be removed separately, or taken out with the kidneys; in either case it is best to remove the organs on the left side first. Section is made of the adrenals; also of the kidneys. In the latter the capsule is stripped off, and a note is made of the extent, if at all, to which it is adherent; also whether the renal substance is torn on removing the capsule.

The next step consists in the **removal of the intestines.** These are cut closely to their mesenteric attachment, care being taken to leave as little of the mesentery attached to the gut as possible. The fecal contents are then washed out by a running stream of water through the bowel, which is opened at the attachment of the mesentery and examined. In removing the intestines the rectum and the first and second portions of the duodenum are left *in situ*. The next step is usually the **opening of the stomach** and remaining portion of the duodenum. This is accomplished, like the opening of the intestines, by means of the enterotome. After the duodenum is opened, the **gall-bladder** is pressed until bile is made to flow from the mouth of the common duct in the duodenum. If this is impossible, obstruction exists. The gastric contents are described, and the condition of the walls noted. The **pancreas** is now examined, the condition of its duct, and the presence of cysts or stones being noted. It is then removed and incised longitudinally.

The liver is next taken out, the condition of the vessels entering the portal fissure having been noted before they were divided. The liver is weighed and measured transversely, longitudinally, and vertically, the width of the two large lobes being taken separately. A long incision is now made into the substance of the organ and the conditions noted, especially the relation of the connective tissue to the hepatic substance proper.

The pelvic organs are next removed. This is best accomplished by first making a cut into the **bladder;** into the opening a finger is inserted, while the other fingers grasp the rectum. By making the tissues tense, their separation from the bony wall of the pelvis is facilitated. After removal they are cut open; in the case of a female subject the **uterus** is opened by a longitudinal cut through the anterior wall. A fine probe is passed into the oviducts to ascertain their patulousness; they may also be opened by a delicate pair of scissors.

Nothing of importance remains now in the abdomen except the vessels and the semilunar ganglia. The latter should be examined *in situ* and also after removal. The **aorta** should be opened by a longitudinal incision extending from the beginning of the arch down to its bifurcation, thence prolonged out into the iliac arteries. The **thoracic duct** should be looked for at the side of the aorta. The **trachea,** larynx, thyroid gland, pharynx, and tongue can be removed either through a median incision in the front of the neck or from the base of the neck.

For the **removal of the brain** it is necessary to saw out a portion of the cranial vault. It is customary to divide the scalp about on a line with the coronal suture. The vault is sawed through in front and behind, a large, wedge-shaped piece being removed. The dura is then divided on a line with the sawed edge of the bone, and also separated from the attachment to the crista galli in front. The brain is then carefully lifted from its bed, the nerves passing from it divided, and the attachment of the dura to the petrous portion of the temporal bone cut loose. If possible, the pituitary body should be kept attached to the brain.

A long knife is now introduced into the spinal canal, and the cord cut as low down as possible. The brain is then lifted out and placed on a board or plate. After a careful survey of its external appearances, the organ is dissected. A number of methods are in vogue. One of the best is that known as Edinger's method; only its general features can be indicated here. The lateral ventricles are first opened; then the cerebral hemispheres are cut away from the basal ganglia. Longitudinal and transverse cuts are made into the cerebral mantle, observing always to make the incisions as near as possible at right angles to the course of the convolutions. The basal ganglia are examined by making multiple incisions into them; the cerebellum is similarly treated.

The spinal cord is generally removed from the back; special saws have been devised to cut the pedicles of the vertebræ. The cord itself is removed in its membranes from below upward, the most important point being the avoidance of traction. The membranes are opened, and the cord substance divided at short intervals by transverse cuts. The eyes, if it is necessary, can be removed without difficulty. The removal of the organ of hearing requires considerable labor. All organs should, if possible, be weighed.

POSTPARTUM HEMORRHAGE.—Hemorrhage during and after the third stage of labor. Should it occur after the first 24 hours of the puerperium, it is called puerperal hemorrhage.

Postpartum hemorrhage may be divided into: (1) Hemorrhage from relaxation of the uterus; (2) hemorrhage from rupture of the uterus; (3) hemorrhage from inversion of the uterus; (4) hemorrhage from lacerations of the lower birth canal, and (5) hemorrhage into the perivaginal tissues (hematoma).

Hemorrhage from Relaxation of the Uterus.—This is one of the most common forms of postpartum hemorrhage, and is what is meant when the simple term "postpartum hemorrhage" is used.

Causes.—Any condition which interferes with firm contraction of the uterus after the explusion of the child might be mentioned as a cause of postpartum hemorrhage. Of these conditions may be mentioned weakness of the uterine muscle from overdistention; general disease; faulty development; mental anxiety; retained placenta, membranes, or blood-clots; old adhesions; tumors, and distended bladder and rectum.

Symptoms.—The important symptom is hemorrhage, which may appear before or after the expulsion of the placenta. There may be sudden gush of blood, profuse enough to destroy the patient in a few moments; or there may be a succession of gushes, a few ounces of blood being lost every few seconds. Not infrequently there is a steady flow of blood from the uterus, which will only end with the death of the patient or with the most active treatment. Palpation shows a large relaxed uterus, and there are marked constitutional signs of hemorrhage, such as extreme pallor, vertigo, sighing respiration, and, possibly, syncope. The pulse is extremely weak and rapid, or it may be entirely absent at the wrist.

Treatment.—The proper management of the third stage of labor, followed by the application of an abdominal pad and binder, is the best preventive treatment of postpartum hemorrhage. When one has special cause to fear hemorrhage, as in case of multiple pregnancy, hydramnios, and the like, a good precautionary measure is the hypodermic injection of 3 to 5 grains of ergotin as soon as the child's head is born.

In the majority of instances a postpartum hemorrhage may be quickly controlled by **external stimulation of the uterus.** The fundus is grasped by the hand through the abdominal wall, and is pinched, kneaded, and irritated until, in favorable cases, it becomes firm and hard and the bleeding ceases. If the placenta is not yet expelled, it should be expressed by the Credé method. If the foregoing procedure fails to control the bleeding, the disengaged hand should be passed into the uterine cavity and all placenta, membranes, and blood-clots should quickly be removed. This **internal stimulation of the uterus** will usually prove most effective. Should this fail and should the hemorrhage be rather slight in amount, **hot douching** may next be tried. A fountain syringe is filled with plain boiled water at a temperature of 120° F., and this thrown well up into the uterine cavity by means of a large two-way metal catheter. Should the bleeding be alarming in quantity or should this latter method fail, the last and most effective method of treatment is the use of the **intrauterine tampon.** The best material for plugging the uterus is 5 percent iodoform gauze. The patient is brought across the bed with the buttocks extending well over the edge; the anterior and posterior lips of the uterus are each grasped with a double tenaculum and drawn well down toward the vulvar orifice. The end of the gauze is seized with dressing forceps and, guided by two fingers of the left hand, introduced into the cervix and pushed well up to the fundus; the dressing forceps are now removed and successive portions of the gauze are carried up until the uterine cavity is firmly packed from above downward. If the packing is done properly, from 3 to 5 yards of gauze will be required. This is followed by packing the vagina, either loosely or tightly as may be indicated. In exceptional cases when the uterus is entirely atonic, it may be necessary to reinforce the vaginal tampon by a large perineal pad and binder, the two ends of the binder being firmly attached to the abdominal binder.

The subsequent treatment will depend upon the amount of blood the patient has lost, and upon her general condition. After a moderately severe hemorrhage it will be sufficient to remove the pillow from under the patient's head and raise the foot of the bed; to give some rapidly acting cardiac stimulant; hypodermic injections of ether, brandy, or carbonate of ammonium; to give frequently repeated teaspoonful doses of strong hot coffee, hot water and brandy, hot milk, red wine, or champagne; and to surround the patient with hot bottles, and cover her with warm blankets.

When the anemia is extreme, it is necessary, in addition to the preceding, to replace the lost fluid as quickly as possible. This is done most readily by the injection of a normal salt solution—about 40 grains of NaCl to the pint of warm water—into the large intestine. Two or 3 pints of this solution, if retained will cause a very marked and rapid improvement in the pulse. If the bowel will not retain this solution, it should be given subcutaneously. A cannula about the size of a rye-straw is attached to the rubber tube of a fountain syringe; the syringe, placed about 6 feet above the patient, is filled with a sterile salt solution; the cannula is plunged directly into the cellular tissue underneath the mammary gland, starting at the outer periphery of the gland; the fluid is allowed to drain into the tissues until a pint or more has been absorbed. Both breasts may be filled with this solution, or the loose tissue in the axilla or between the scapulæ may be selected for this purpose. Autotransfusion (bandaging the extremities and thus forcing the blood into the vital organs) will be found a useful adjunct. After the patient has reacted, a hypodermic injection of morphin (1/6 grain) will quiet her, and probably induce a much-needed sleep.

Hemorrhage from Rupture of the Uterus.—Rupture of the uterus is one of the rarest accidents of labor, occurring once in about 4000 cases. The position of the rent is most frequently in the lower uterine segment. Occasionally, the rupture is an incomplete one, involving the mucous and muscular coats only.

Causes.—The most frequent cause is some serious obstruction to labor, such as grave degrees of contracted pelvis, malposition of the child, and tumors obstructing the pelvic canal. Any conditon weakening the uterine wall, such as fatty degeneration of the muscle, or a previous cesarean section, predisposes toward rupture. External traumatism may be mentioned as a rare cause.

Symptoms.—Rupture of the uterus may occur at any time during labor, but it occurs most frequently during the second stage. A prolonged second stage of labor, with frequent severe pains, thinning of the lower uterine segment, and rise of the contraction ring, should be looked upon with apprehension, as they are premonitory signs of rupture. At the time of rupture there are usually violent pain and a sensation as though something had "given away." There are pronounced shock, rapid weak pulse, pallid, leaking skin, fall of temperature, and sighing respirations.

Physical Signs.—The os is widely dilated; the membranes are ruptured; the presenting part, unless it has been firmly engaged, recedes; the uterine contractions cease, and the child may plainly be felt in the abdominal cavity. It may be possible to feel the rent in the uterus, with perhaps loops of intestines projecting through it. Rupture of the uterus may occur, rarely, without any of these symptoms—the rent being discovered during efforts at the removal of the placenta. In rare instances the uterus may rupture during the puerperium as a result of pressure necrosis, septic ulceration, or malignant degeneration of the deciduæ. The symptoms and treatment are those of septic infection.

Prognosis.—This depends largely upon the extent of rupture, the amount of hemorrhage, the cleanliness with which labor has been conducted, and the treatment. The mortality is variously given at from 55 to 90 percent. The two chief dangers are hemorrhage and sepsis.

Treatment.—This will depend upon the conditions present. Rupture of the uterus can be prevented, usually, by the proper treatment of labor complicated by contracted pelves, by correction of malpositions, and the like.

If the child is delivered before the rent is diagnosed, the treatment will depend upon the amount of hemorrhage. The placenta should be delivered immediately and a hypodermic injection of ergotin administered. If the hemorrhage is slight, a strip of iodoform gauze may be introduced into the rent to secure. drainage. No further treatment is necessary except the removal of the gauze at the end of 24 hours. It the child is not delivered and is still in the uterine cavity, it must be extracted immediately by forceps, version, or craniotomy. If it has been extruded into the abdominal cavity, laparotomy must be performed immediately. In all cases when the rent is large, when the hemorrhage is great, and when it is believed that septic material has escaped into the peritoneal cavity, the abdomen must be opened, the peritoneal cavity cleansed, and the uterus amputated, or the rent closed, as may be indicated. When a conservative plan of treatment is at first pursued, it may be necessary to open the abdomen later on account of the occurrence of septic infection.

Hemorrhage from Inversion of the Uterus.—This is an extremely rare accident. It may occur before or after the expulsion of the placenta.

Causes.—Effort to secure delivery of the placenta by traction on the cord is probably the most important cause. Precipitate labor and paralysis of the placental site have also been mentioned as causes.

Symptoms.—The important symptoms are shock and hemorrhage. The former is most marked, the latter is variable. Pain may be present, although it is not a constant symptom.

Physical Signs.—A soft, round, tumor protrudes from the vulva. To it may be attached all or portions of the placenta. The orifices of the fallopian tubes may be seen on either side. The finger passed along the side of the tumor at its apparent attachment feels the symmetrically reflected cervix surrounding it. Abdominal palpation shows an absence of the fundus, a cup-shaped depression, containing, perhaps, the tubes and ovaries, being felt instead.

Prognosis.—This is very grave unless the uterus can be quickly replaced. Shock, hemorrhage, and sepsis may be causes of death.

Treatment.—This consists in immediate reposition. The uterus is grasped in such a manner that the fundus rests upon the palm of the hand, the fingers and thumb surrounding the reflected portion of the cervix. The vaginal part of the cervix is gradually dilated with the tips of the fingers, and the body of the uterus is passed steadily upward and forward until reduction is complete. If the placenta is adherent, it should be removed before attempting replacement.

Hemorrhage from Lacerations of the Lower Birth Canal.—Lacerations of the lower birth canal resulting in profuse hemorrhage are situated in the cervix, anterior vaginal wall, near the urethra, or about the clitoris. Inspection of the cervix, vagina, and vulva will speedily make the diagnosis.

Treatment.—If of the cervix, a tampon of iodoform gauze packed closely around the vaginal aspect will quickly control it. In very rare cases it may be necessary to suture it. If of the anterior vaginal wall or about the clitoris, a provisional tampon may be introduced, which is subsequently removed and the tear closely sutured.

Hemorrhage into the Perivaginal Tissues.—This is a rather infrequent complication of labor. It may occur in the labia, underneath the vaginal wall, or in the broad ligament.

Causes.—A varicose condition of the veins, which is so constant an accompaniment of pregnancy, is the predisposing cause. The exciting cause is the traumatism inflicted by the passage of the child; or it may be due to the use of forceps or other manipulations in securing delivery.

Symptoms.—Sharp pain is felt at the time of rupture, and, in exceptional cases, there may be signs of internal bleeding.

Physical Signs.—A bluish tumor, varying in size from a walnut to a fetal head, may be seen at the vulva, or may be felt in the vagina. It gradually increases in size, and is elastic or fluctuating. Very rarely it may rupture externally, causing profuse hemorrhage.

Prognosis.—If properly treated, the prognosis is favorable. The most serious complication is infection of the blood-clot.

Treatment.—If the bleeding does not subside spontaneously, it should be controlled by pressure and the application of ice. Subsequently, absorption should be encouraged by absolute quiet, cleanliness, and protection. If suppuration should occur, free incisions, with irrigation and drainage, must be resorted to. In exceptional cases it may be necessary to incise the tumor, turn out the clot, and ligate the bleeding point.

POSTURE.—See GYNECOLOGIC EXAMINATION.

POTASSIUM.—K = 39; quantivalence I; specific gravity 0.865. A metallic element, of silvery luster, and characterized by intense affinity for oxygen. Its peculiar reactions are its precipitation when converted into the acid tartrate, its precipitation by platinum perchlorid, and the violet color it imparts to the flame. Physiologically, salts of potassium are protoplasmic poisons when applied locally in sufficient concentration. They dialyze more readily than sodium salts. In the body they occur especially in the solid structures, while sodium salts predominate in the fluids. In large doses by the mouth, potassium salts act as irritants to the gastrointestinal tract. The circulation is generally depressed by potassium salts—after small doses the primary depression of the pulse-rate and arterial pressure is followed by a rise of both; large doses cause a rapid fall of pressure and pulse-rate. Injected into a vein, salts of potassium cause paralysis of the heart. Potassium salts are obtained from the ash of plants, from saltpeter, from the potassium bitartrate deposited from urine in the process of fermentation, and from the washings of sheep's wool. The action of the various salts is given under their proper headings.

Preparations.—**P. Acetas,** $KC_2H_3O_2$, an easily soluble salt having marked diuretic properties. Dose, 5 grains to 1 dram. Purgative doses, 2 to 4 drams. **P. Arsenitis, Liquor,** Fowler's solution. See Arsenic. **P. Bicarbonas,** $KHCO_3$, a salt with properties like the carbonate, to which it is preferable. Dose, 5 to 45 grains. **P. Bitartras,** $KHC_4H_4O_6$. See P. Tartras. Dose, 20 to 60 grains as a diuretic; 1/2 to 1 ounce as a purgative. **P. Bromid,** KBr, a colorless, crystalline, bitter salt, readily soluble in water. It is extensively employed as a sedative in nervous excitement, and is one of the best drugs in epilepsy. Its prolonged use causes the condition known as Bromism (*q. v.*). **P. Carbonas,** K_2CO_3, used locally in acne and acute eczema, internally in rheumatism, in the uric acid diathesis, and in jaundice. Dose, 2 to 20 grains. **P., Caustic,** potassium hydroxid. **P. Chloras,** $KClO_3$, a crystalline compound, with a saline, cooling taste. It is soluble in 15 or 16 parts of cold, and readily soluble in boiling, water. It is used as a gargle in diseases of the mouth and throat, in mercurial stomatitis, etc. Dose, 1 to 10 grains. In toxic doses it causes disorganization of the blood (converting the hemoglobin into methemoglobin) and intense irritation of the kidneys, with hematuria and blood casts. Sir James Y. Simpson recommended it, in doses of 20 grains thrice daily, in threatened abortion from fatty degeneration of the placenta. **P. Chloratis, Troch.,** each containing 2 1/2 grains of the salt. Dose, 1 to 3. **P. Citras,** $K_3C_6H_5O_7.H_2O$, is used in solution as a febrifuge, a diuretic, and to alkalinize the urine. Dose, 10 to 30 grains. **P. Citratis, Liq.,** citric acid 6, potassium bicarbonate 8; filter and add enough distilled water to make 50 parts. Dose, 1/2 to 1 ounce. **P. Citras Effervescens** consists of the citrate 20, sodium bicarbonate 47, tartaric acid 25, and citric acid 16. Dose, 1 to 2 drams in a glass of water as an effervescing drink. **P. Cyanid.,** KCN, made from potassium ferrocyanid by the action of heat, sometimes with (also without) the addition of potassium carbonate and charcoal. It is very soluble in water, has active reducing powers, and is very poisonous. It has the sedative and antispasmodic action of hydrocyanic acid, and, like it, is used in gastric irritability and cough. Dose, 1/20 grain. **P. Dichromas.** Synonym of P. Bichromas. An antiseptic and escharotic milder than chromic trioxid. Internally it has been efficient in chronic nasal, gastric, or intestinal catarrh, chronic ulcers of the mouth and pharynx, chronic bronchitis, laryngitis, rheumatism, locomotor ataxia, sometimes in diphtheria. Dose, 1/10 to 1/2 grain in trituration. Locally it is used in aqueous solution (5 grains to 1 dram to the ounce). **P. et Sodii Tartras,** $KNaC_4H_4O_6.4H_2O$, "Rochelle salt," laxative. Dose, 1 to 4 drams. **P. Ferrocyanid,** $K_4FeC_6N_6+3H_2O$, yellow prussiate of potash, prepared from blood, and by heating together animal charcoal, iron, and pearl ash. It occurs in yellow crystals, soluble in water. It has many uses in chemic analysis. **P. Hydroxidum,** KHO, potassa, "caustic potash," deliquescent and very alkaline. A powerful escharotic. **P. Hydroxidi Liquor,** an aqueous solution of about 5 percent of **P. Hydroxid.** Dose, 5 to 30 minims, well diluted with water. **P. Hypophosphis.** See Phosphorus. **P. Iodid.,** KI, used in syphilis, metallic poisoning, and as an antirheumatic. Dose, 2 to 20 grains. See Iodin. **P. Nitras,** KNO_3, saltpeter, niter, crystallizing in long white prisms. Commercially, it is prepared by double decomposition of potassium chlorid and Chili saltpeter, sodium nitrate. Dose, 5 to 20 grains, well diluted **P. Permanganas.** See Manganese. **P. Sulphas,** K_2SO_4, a hepatic stimulant and laxative; soluble in 10 parts of water at ordinary temperature. Dose, 10 to 45 grains. **Pulvis Efferves. Comp.,** compound effervescing powder, "Seidlitz powder," contains in the blue paper potassium bitartrate, 120 grains, mixed with sodium bicarbonate, 40 grains; and in the white paper, tartaric acid, 35 grains.

POTT'S DISEASE.—See Spine (Curvature).

POTT'S FRACTURE.—See Ankle (Fracture).

POULTICE (Cataplasm).—Generally employed as a means of applying heat and moisture to a certain portion of the body, but is sometimes medicated with anodyne, counterirritant or disinfectant agents. An excellent method of preparing poultices is to make several bags of various sizes, of either of the fabrics known as *Swiss* and *cheese-cloth*, filling each bag half full with the linseed meal or other agent used, then sewing up the open end. When wanted for use one of these bags is submerged in boiling water for a few minutes, and on taking it out the meal is found to have swelled so as to fill the bag, which should then be squeezed to rid of superfluous water, laid on the part and covered with oiled silk and a bandage.

The ordinary filthy poultice of flaxseed, slippery elm, bread and milk, has no place among the resources of the aseptic surgeon. The common poultice is a hot-bed for bacteria, and as such, it should be discarded. In the treatment of an ordinary furuncle with poultices, almost every surgeon must have seen occasionally the development of innumerable minute daughter-furuncles in the surface covered by the poultice. In phlegmonous inflammation of the fingers or hand, the prolonged use of the poultice is followed by maceration of the skin, extensive edema of the superficial structures, a flabby condition of the granulation—in fact all the evidences which point to the poultice as a means of favoring the extension of the infectious process (Senn).

A *sinapism* is a poultice or plaster containing mustard (sinapis), used for the purpose of counter-irritation. If applied too hot and kept on too long the skin will become inflamed and ulcerated, and extensive gangrenous sores may result.

The only poultice official in the U. S. P. is the **catapalsma kaolini,** in which glycerin is the active agent. It consists of kaolin, 577 gm.; boric acid, 45 gm.; thymol, 0.5 gm.; methyl salicylate, 2 gm.; oil of peppermint, 0.5 gm.; glycerin, 375 gm.; to make 1000 gm.

Fomentations.—Flannel may be wrung very dry out of boiling water, applied, and covered with oiled silk. Spongiopiline, a fabric composed of sponge and wool, coated with india-rubber, is an excellent vehicle for the application of warmth and moisture. The inner surface is moistened with hot water, and its utility may be increased by sprinkling the moistened surface with charcoal or yeast or by saturating it with any desired lotion or liniment.

POWDER (Pulvis).—In pharmacy one or more medicinal substances reduced to a state of very fine division. Powders are usually prepared extemporaneously, but a few compound ones have been made official, the ingredients being simply rubbed together until reduced to a fine powder and thoroughly mixed. Special directions are given in a few instances. Powders are usually mixed on a slab with a spatula, but, except in the case of explosives, a much better method is trituration in a mortar.

There are 9 official powders:

TITLE.	CONSTITUENTS.	PROPERTIES AND DOSE.
PULVIS:		
Acetanilidi Compositus (Antikamnia?).	Acetanilid, 70 gm.; caffein, 10 gm.; sodium bicarb., 20 gm.	Relieves pain, 8 gr.
Aromaticus........	P. cinnamon, 35 gm.; p. ginger, 35 gm.; p. cardamon, 15 gm.; p. nutmeg, 15 gm.	Aromatic, 15 gr.
Cretæ Compositus..	Prep. chalk, 30 gm.; acacia, 20 gm.; sugar, 50 gm.	For chalk mixture, 30 gr.
Effervescens Compositus (Seidlits powder).	Sodium bicarb., 31 gm.; Rochelle salt, 93 gm.; tartaric acid, 27 gm.: mix the sod. bicarb. and Roch. salt, and divide into 12 pts. (blue papers). Divide the t. acid into 12 pts. (white papers).	Laxative, 1 set of 2 powders.
PULVIS:		
Glycyrrhisæ Compositus (licorice powder).	P. senna, 180 gm.; p. licorice, 236 gm.; washed sulphur, 80 gm.; oil fennel, 4 gm.; sugar, 500 gm.	Laxative, 60 gr
Ipecacuanhæ et Opii (Dover's powder).	P. ipecac, 10 gm.; p. opium, 10 gm.; sugar of milk, 80 gm. Ten grains contain a grain each of the active constituents.	Diaphoretic, 8 gr.
Jalapæ Compositus.	P. jalap, 35 gm.; potass. bitart., 65 gm.	Cathartic, 30 gr.
Morphinæ Compositus (Tully's powder).	Morph. sulph., 1.5 gm.; p. camphor, 32 gm.; p. licorice, 33 gm.; precip. calc. carb., 33.5 gm.	Diaphoretic, 8 gr
Rhei Compositus....	P. rhubard, 25 gm.: magnesia, 65 gm.; p. ginger, 10 gm.	Laxative, antacid, 30 gr.

POX.—See SYPHILIS.

PREDIGESTED FOOD.—See PEPTONIZED FOOD.

PREGNANCY.—The state of the female corresponding to the presence within her body of the product of conception; the period from conception to delivery. When delivery is protracted far beyond the normal time and the ovum is dead, the condition of pregnancy cannot be said to exist. The normal duration of pregnancy in woman is 280 days, or 10 lunar months of 28 days each, or 9 calendar months. Various methods have been devised to estimate the probable termination of pregnancy, one of which, Ely's table, is introduced under CONFINEMENT.

PREGNANCY, DIAGNOSIS.—The signs of pregnancy may be divided into *subjective* and *objective.*

The subjective signs are those which are appreciated by the mother. Arranged in the order of their importance, they are: (1) Cessation of menstruation; (2) nausea and vomiting; (3) change in the size and shape of the abdomen; (4) change in the genitalia and breasts; (5) quickening; and (6) change in the nervous system. These signs, taken alone, are of slight importance, but when they are considered in connection with the objective signs, they become of considerable value.

The objective signs are those which are ascertained by employing the senses of sight, touch, and hearing.

Inspection shows splotches of pigmentation on the face and dark circles under the eyes. The breasts are enlarged, the nipples are prominent, the areola is widened and darkened, a secondary areola is developed, the glands of Montgomery are enlarged, and pressure on the breast from the periphery toward the nipple will cause the appearance of a drop or two of turbid fluid—colostrum. The abdomen is symmetrically enlarged, striæ are present, the umbilicus is pigmented, and after the sixth month of gestation projects from the surface of the abdomen, and fetal movements can be seen. The mucous membrane of the vulva and vagina is dark purple in color.

Palpation ascertains the size and shape of the uterus; the intermittent uterine contractions; and in advanced cases the position of the fetal back, head, and extremities. Vaginal examination shows softening of the cervix and lower uterine segment; change in the shape, size, and consistency of the uterus; and ballottement. See Ballottement.

Auscultation reveals the fetal heart-sounds, the uterine souffle, and at times the funic souffle.

For convenience of clinical diagnosis it is best to divide the signs of pregnancy into three groups:

1. Those manifesting themselves during the *first three months* are: Cessation of menstruation, nausea and vomiting, enlargement of the breasts, soft cervix and lower uterine segment, and change in the size, shape, and consistency of the uterus.
2. During the *second three months* there are, in addition to the foregoing, intermittent uterine contractions, ballottement, fetal movements and heart-sounds, and purple discoloration of the vaginal mucous membrane.
3. During the *last three months*, in addition it is possible to ascertain the position of the back, head, and extremities, and to determine the presenting part.

Of these signs, ballottement, fetal heart-sounds, and fetal movements are considered absolutely diagnostic.

PREGNANCY, DISEASES.—These are considered under their appropriate headings. See Amnion, Chorion, Eclampsia, Colon Bacillus Infection, Nephritis of Pregnancy, etc.

PREGNANCY, DURATION.—See Confinement.

PREGNANCY, EXTRAUTERINE OR ECTOPIC.—See Extrauterine Pregnancy.

PREGNANCY, FALSE.—See Pseudocyesis.

PREGNANCY, MULTIPLE.—Two or more fecundated ova or fetuses occupying the uterus at the same time. Twin births occur once in about 100 cases, triplets occur once in about 8000, and quadruplets once in about 400,000 cases. Twin pregnancy occurs when 2 ova are fecundated at or near the same time; or two fetuses may develop from a single ovum. If the twins are developed from 2 ova, each twin has its own amnion, chorion, and placenta; if from 1 ovum, there is but one chorion and placenta.

The diagnosis of multiple pregnancy is difficult, and is usually not made until birth. Irregularity in the shape and excessive size of the abdomen would be suggestive. Edema of the lower part of the abdominal wall and lower extremities is a common sign, while the presence of an abnormal number of extremities would be almost diagnostic. The only positive signs are: The existence of 2 fetal heart-sounds, of different rates, heard with greatest intensity at different points on the abdomen; and the palpation of two heads, two breeches, or multiple extremities.

The prognosis for both mother and child is somewhat graver than in single pregnancy. The dangers to the mother are albuminuria and eclampsia, postpartum hemorrhage, and a long, tedious, and complicated labor. The children are likely to be ill developed from lack of room; monsters, from anastomoses between fetal and placental vessels, frequently occur, and usually there are serious complications at birth.

The treatment of labor in multiple pregnancy is the same as in ordinary pregnancy until the first child is born. After this has occurred the cord should be ligated and the position and presentation of the second child determined. If this is faulty, as it frequently is on account of the roominess of the uterus, it should be corrected immediately, and a dram of the fluidextract of ergot administered. The second child is usually born within an hour after the first; a longer delay than this demands some artificial interference.

PREGNANCY, PERNICIOUS VOMITING.—The variety of vomiting occasionally seen in pregnancy that becomes so excessive as to threaten the patient's life.

Causes.—The causes of pernicious vomiting are extremely varied. The most common are: (1) Reflex disturbance, caused by the rapid growth and distention of the uterus, with irritation of its contained nerve endings; (2) some pathologic condition of the uterus or its adnexa, such as endometritis or inflammation of the tubes and ovaries; (3) some pathologic condition of the gastrointestinal tract, such as gastritis or gastric ulcer; (4) excessive sexual intercourse; (5) kidney insufficiency.

Symptoms.—The ordinary physiologic vomiting of pregnancy becomes exaggerated until the patient vomits almost continuously. Anything taken into the stomach is immediately vomited, and with it bile-stained mucus. Blood is not infrequently mixed with the vomited material. The mere sight or thought of food is enough to provoke an attack of vomiting. There is intense thirst; the patient becomes extremely weak and emaciated; the temperature is usually subnormal; the respirations are rapid; the pulse becomes rapid and feeble; coma supervenes, and death occurs from profound exhaustion.

Diagnosis.—The diagnosis of the condition is easy, while that of the cause of the condition is difficult. From the fact that it occurs early in pregnancy, usually from the second to the fourth month, the existence of pregnancy may be overlooked. Should the vomiting occur late in pregnancy, kidney disturbance should be suspected.

Prognosis.—The prognosis is grave. In general practice the mortality ranges from 25 to 50 percent.

Treatment.—The patient should be confined to bed in a quiet, darkened room. The bowels should be kept freely open, and a suitable diet given. This should consist of easily digestible foods, such as milk, broths, eggs, and the like. Sexual intercourse must be prohibited. Should any local exciting cause be found, it should, if possible, be removed. Thus, a displaced uterus should be replaced; erosion of the cervix or inflammation of the cervical canal should be treated by the application of a solution of silver nitrate (20 grains to the ounce); inflammation of the tubes and ovaries may be treated by the careful use of tampons and douches. Drugs that allay nervousness are sometimes beneficial; grain doses of the aqueous extract of opium by suppository, or 10-grain doses of sodium bromid in a dessertspoonful of camphor water may be given 3 or 4 times daily. Other drugs that have been found useful at times are: Cocain (1/4 of a grain), silver nitrate (1/4 of a grain), oxalate of cerium (10 grains), hydrobromid of hyoscin (1/120 of a grain), antipyrin (8 grains), tincture of aconite (6 minims), tincture of iodin (2 minims), tincture of nux vomica (10 minims), and creosote (1 minim).

If the patient cannot retain any food by the mouth, all efforts in this direction should cease and she should be fed by the rectum. If this is properly done, life may be sustained for days or even weeks. The following rules should be observed in rectal alimentation: (1) The enema must consist of predigested food. A very good one is the following: Three ounces of peptonized milk, 2 ounces of liquid peptonoids, 1/2 of an ounce of whisky, and 15 drops of tincture of opium. (2) The enema should not exceed 6 ounces in quantity. (3) It should be given regularly at intervals of 4 or 5 hours. (4) It should be preceded by irrigation of the lower bowel with a normal salt solution.

If the patient fails to improve under this course of treatment, the induction of abortion is indicated. This final step in the treatment of pernicious vomiting must not be delayed too long or the exhaustion will become so great that it will fail. If vomiting continues after 6 or 8 days of rectal feeding; if her temperature rises or remains subnormal; if her pulse becomes rapid and weak; if, in short, she presents the picture of pronounced exhaustion, abortion should be induced immediately in the manner already described. Dilatation of the cervical canal and internal os with the finger has been tried with benefit in a certain proportion of cases. It should be given a trial just previous to the induction of abortion.

PREMATURE LABOR.—See LABOR (Premature).

PRESBYOPIA (Old-age Sight).—A condition of the eye in which the power of accommodation is either partially or wholly lost by age. Properly speaking, presbyopia implies diminution of the accommodative power in adults past middle life to such an extent as to interfere with near vision. Presbyopia usually occurs between 40 and 50 years of age. As a hyperopic eye is obliged to exert a portion of its power of accommodation to overcome its refractive error, it necessarily has less accommodative power in reserve, and consequently becomes presbyopic sooner than an emmetropic or myopic eye. An uncorrected myope may never exhibit the signs of presbyopia, as he can read at his far-point, but if he wears a distant correction, he will have the same need for a reading glass about the presbyopic age as the emmetrope or hyperope. See AMETROPIA.

Cause.—The direct cause of presbyopia is the diminishing elasticity of the lens, simultaneously with the solidification and sclerosing conditions which take place elsewhere in the body with advancing age. As a consequence of the changes in the lens-structure, it gradually loses its power to become convex, and hence to refract diverging rays from a near-point so that they will meet directly on the retina and give a clear image. This diminution in the refractive power of the lens is physiologic, and when it has advanced to such a point that rays at the average reading distance—about 13 inches— are no longer refracted exactly on the retina, presbyopia is said to have commenced.

Notwithstanding the fact that each patient should be studied individually, and no arbitrary rules can be constructed by which we can estimate the relative range of accommodation to age, for convenience it is desirable to have the following tables in the mind in refracting presbyopes:

AGE IN YEARS.	ACCOMMODATION IN DIOPTERS.	AGE IN YEARS.	ACCOMMODATION IN DIOPTERS.
10,	14	45,	3.5
15,	12	50	2.5
20,	10	55,	1.75
25,	8.5	60,	1
30,	7	65,	0.75
35,	5.5	70,	0.25
40,	4.5	75,	0.

	ADDITIONAL GLASS REQUIRED TO PRODUCE A COMFORTABLE WORKING NEAR-POINT.
45,	+1 D.
50,	+1.75 D.
55,	+2.50 D.
60.	+3 D.
65, or over,	+3.50 D.

Symptoms.—The chief symptom of recession of the near-point beyond the ordinary working distance is dimness of vision for near-work, the patient particularly complaining of inability to read, write, or sew, without holding the work at an uncomfortably increased distance. The ordinary symptoms of accommodative asthenopia are very often present, and it is quite likely that the headaches, dyspepia, and neurotic conditions in women about 45 years of age, so often attributed to the menopause, are really directly due to eye-strain. The gradual progress of presbyopia, together with the attempt of nature to remedy the defect by narrowing the pupil, somewhat delays the marked symptoms, and, unfortunately, most presbyopes unconsciously undergo considerable eye-strain before seeking the oculist.

Diagnosis rests on the age of the person, the history of failing near vision, the recession of the near-point as tested with the Jaeger types, and the acceptance of a convex lens at close range. A loss of accommodation disproportionate with the age is indicative of ciliary palsy or insufficiency.

Treatment.—In every case it is necessary to detect and properly correct the hyperopia, myopia, or astigmatism that may exist; and for this purpose, in strong, vigorous persons under 50 the administration of a mydriatic is necessary. Following the ordinary method of prescribing lenses for distance in the kind and degree of ametropia detected, we correct the presbyopia by adding to the distant correction a convex spheric lens that gives the best vision at an ordinary working distance. If allowed to choose the glass and distance, the presbyope will usually select a strong glass at a close reading point, and thus lead the examiner into error. Always try the test-lenses with the reading card at least 13 inches from the eye. Again, it must be constantly borne in mind that the patient's occupation is an important factor to be considered in prescribing presbyopic glasses; the engraver needs stronger glasses than the seamstress, and, conversely, persons working at a comparatively long distance, such as musicians, artists, ministers in the pulpit, etc., need weaker glasses in the pursuit of their occupations than they do for ordinary reading.

PRESCRIPTION-WRITING.—Although prescriptions in good English are preferable to those written in incorrect or badly abbreviated Latin, the classic formulas of prescription-writing, taken from Potter, are given below:

A prescription should begin with the name of the person for whom it is designed, and the date on which it is written. Then follows the Latin word *Recipe*, usually abbreviated to the sign ℞, and signifying "Take," or "Take thou"; next the names and quantities of the ingredients to be used, which are also expressed in Latin; then the directions to the compounder, followed by the directions to the patient, the last being now usually expressed in English; and, finally, the signature and address of the prescriber.

A prescription then has four component parts —viz.:

Superscription—consisting of the name of the party for whom it is designed, the date, and the sign ℞, signifying "Take thou."

Inscription—the body of the prescription, consisting of one or more of the following subdivisions —viz.:

Basis—or chief active ingredient.

Adjuvant—to assist the action of the basis.

Corrective—to correct some injurious quality of the other ingredients.

Vehicle or excipient—giving the prescription a suitable form.

Subscription—the directions for the compounder, usually expressed in contracted Latin.

Signature—the instructions for the guidance of the one administering the medicine, in English, followed by the signature of the prescriber.

A prescription may, however, contain the base alone, or the base with the adjuvant, or the base with a simple vehicle or diluent. A single ingredient may serve a double or treble office, as the syrupus rhei aromaticus with quinin, in which case the syrup serves as an adjuvant to increase the action of the quinin, as an excipient to cover the taste, and as a vehicle to facilitate the administration of the dose directed. Again, the basis may need no aid in doing its work, and may require no corrective of its action, nor any special vehicle. On the other hand, there is no limit to the number of ingredients which may be used, provided that the prescriber has a clear idea of something to be accomplished by each one, and also provided that there is no chemic or medical incompatibility between them. The tendency of the present age is toward monopharmacy, rather than polypharmacy. However, proper combinations of medicines will often produce effects for the patient's good which could not be obtained from the use of any one remedy.

Procedure in Writing a Prescription.—In writing an extemporaneous prescription, the first step is to write the patient's name and address, the date, and the sign ℞. Then the title of each ingredient should be written in Latin and in the genitive case, except that when a certain number only of an ingredient is ordered, the name of the ingredient should be in the accusative case: for example, *Vitellum unum*, "one yolk of egg." Next, the quantity of each ingredient sufficient for one dose should be mentally determined and multiplied by the number of doses which the mixture is to contain, and the result set down in signs and Roman numerals. The directions to the pharmacist and patient being added, and the prescriber's name or initials affixed, the prescription is completed; but when very active agents are used, it is a good plan to go over the calculations a second time before letting it leave the hands of the person most responsible for its action. For pills or powders the same process should be employed, slightly varied according to the requirements of each case. Frequently, the ingredients and quantities for but one pill, powder, or suppository are named, with instructions to make a certain number after the formula. When an unusually large dose of any poisonous drug is prescribed, it is customary to underline the quantity.

An example will perhaps make the foregoing more comprehensible, and at the same time serve to indicate the style of Latin writing formerly employed. The following formula is that ordered in the U. S. P. for the preparation known as Black draft, but officially styled the compound infusion of senna, approximate weigths and measures being substituted for the pharmacopeial metric weights:

	For Mrs. John Black. January 1, 1911. *Recipe*, Take,—	SUPERSCRIPTION.
(Basis.)	*Sennæ, semiunciam*, Of senna, half an ounce. *Magnesii sulphatis*, Of magnesium sulphate.	INSCRIPTION.
(Adjuvant.)	*Mannæ, ana unciam unam*, Of manna, of each an ounce.	
(Corrective.)	*Fœniculi, drachmam*, Of fennel, 1 dram.	
(Vehicle.)	*Aquæ bullientis, fluiduncias octo*, Of boiling water, 8 fluidounces.	
	Macera per horam in vase clauso, deinde cola. Macerate for an hour in a closed vessel, then strain.	SUBSCRIPTION.
	Signetur, Let it be entitled—*A wineglassful every 4 hours until it operates.* *Charles White, M.D.*	SIGNATURE.

Abbreviated in the style usual among physicians, the above prescription would read as follows:

For Mrs. John Black. *January* 1, 1911.
℞. Sennæ, ℥ ss
Magnesii sulphat.,
Mannæ, āā ℥ j
Fœniculi, ʒ j
Aquæ bull., ℥ viij.
Mac. per hor. in vase clauso, deinde cola.
Sig.—A wineglassful every 4 hours, until it operates. *C. White, M. D.*

TABLE OF PRESCRIPTION DOSES AND QUANTITIES (Potter).

Grains in Entire Mixture.	Grains in Each ʒ Dose in a Mixture of							
	℥j	℥ij	℥iij	℥iv	℥vj	℥viij	℥xij	℥xvj
1/10	1/80	1/160	1/240	1/320				
1/8	1/64	1/128	1/192	1/256	1/384			
1/6	1/48	1/96	1/144	1/192	1/288	1/384		
1/4	1/32	1/64	1/96	1/128	1/192	1/256		
1/3	1/24	1/48	1/72	1/96	1/144	1/192	1/288	
1/2	1/16	1/32	1/48	1/64	1/96	1/128	1/192	
2/3	1/12	1/24	1/36	1/48	1/72	1/96	1/144	1/192
3/4	1/11	1/21	1/32	1/43	1/64	1/85	1/128	1/171
I	1/8	1/16	1/24	1/32	1/48	1/64	1/96	1/128
Iss	2/11	1/11	1/16	1/21	1/32	1/43	1/64	1/85
IJ	1/4	1/8	1/12	1/16	1/24	1/32	1/48	1/64
IIss	1/3	1/6	1/9	1/12	1/20	1/24	1/40	1/48
IIJ	3/8	3/16	1/8	1/11	1/16	1/20	1/32	1/40
IIIss	3/7	2/9	1/7	1/9	1/14	1/18	1/28	1/36
IV	1/2	1/4	1/6	1/8	1/12	1/16	1/24	1/32
IVss	4/7	2/7	2/11	1/7	1/11	1/14	1/22	1/28
V	5/8	5/16	1/5	1/6	1/10	1/12	1/20	1/24
VJ	3/4	3/8	1/4	3/16	1/8	1/10	1/16	1/20
VIJ	7/8	3/7	2/7	2/9	1/7	1/9	1/14	1/18
VIIJ	1	1/2	1/3	1/4	1/6	1/8	1/12	1/16
IX	1 1/8	4/7	3/8	2/7	3/16	1/7	1/11	1/14
X	1 1/4	5/8	5/12	5/16	1/5	1/6	1/10	1/12
XJ	1 3/8	11/16	4/9	4/11	2/9	2/11	1/9	1/11
XIJ	1 1/2	3/4	1/2	3/8	1/4	1/5	1/8	1/10
XIIJ	1 5/8	4/5	6/11	2/5	3/11	1/5	1/7	1/10
XIV	1 3/4	7/8	4/7	3/7	2/7	2/9	1/7	1/9
XV	1 7/8	15/16	5/8	7/15	5/16	2/9	1/6	1/9
XVJ	2	1	2/3	1/2	1/3	1/4	1/6	1/8
XVIJ	2 1/8	1 1/16	7/10	8/15	4/11	3/11	1/6	1/8
XVIIJ	2 1/4	1 1/8	3/4	9/16	3/8	2/7	3/16	1/7
XIX	2 3/8	1 3/16	4/5	3/5	2/5	3/10	1/5	1/7
XX	2 1/2	1 1/4	5/6	5/8	5/12	5/16	1/5	1/6
XXJ	2 5/8	1 5/16	7/8	2/3	3/7	1/3	2/9	1/6
XXIJ	2 3/4	1 3/8	11/12	11/16	4/9	1/3	2/9	1/6
XXIV	3	1 1/2	1	3/4	1/2	3/8	1/4	1/5
XXVJ	3 1/4	1 5/8	1 1/12	9/11	6/11	2/5	3/11	1/5
XXVIIJ	3 1/2	1 3/4	1 1/6	7/8	4/7	3/7	2/7	2/9
XXIX	3 5/8	1 9/11	1 1/5	10/11	3/5	4/9	3/10	2/9
XXX (ʒss)	3 3/4	1 7/8	1 1/4	15/16	5/8	5/11	5/16	1/4

Grains in Entire Mixture.	Grains in Each ʒ Dose in a Mixture of							
	℥j	℥ij	℥iij	℥iv	℥vj	℥viij	℥xij	℥xvj
XXXJ	3 7/8	1 15/16	1 2/7	31/32	7/11	8/17	5/16	1/4
XXXIJ	4	2	1 1/3	1	2/3	1/2	1/3	1/4
XXXIIJ	4 1/8	2 1/16	1 3/8	1 1/32	11/16	1/2	1/3	3/11
XXXIV	4 1/4	2 1/8	1 3/8	1 1/16	7/10	8/15	4/11	3/11
XXXV	4 3/8	2 3/16	1 4/9	1 1/11	5/7	5/9	4/11	2/7
XXXVJ	4 1/2	2 1/4	1 1/2	1 1/8	3/4	9/16	3/8	2/7
XXXVIIJ	4 3/4	2 3/8	1 4/7	1 3/16	4/5	3/5	2/5	3/10
XXXIX	4 7/8	2 7/16	1 5/8	1 2/9	9/11	3/5	2/5	5/16
XL	5	2 1/2	1 2/3	1 1/4	5/6	5/8	5/12	5/16
XLJ	5 1/8	2 9/16	1 7/10	1 2/7	6/7	7/11	3/7	1/3
XLIJ	5 1/4	2 5/8	1 3/4	1 5/16	7/8	2/3	7/16	1/3
XLIIJ	5 3/8	2 11/16	1 4/5	1 1/3	8/9	2/3	4/9	1/3
XLIV	5 1/2	2 3/4	1 5/6	1 3/8	11/12	11/16	5/11	5/14
XLV	5 5/8	2 4/5	1 7/8	1 2/5	15/16	7/10	7/15	5/14
XLVIJ	5 7/8	2 9/10	1 9/10	1 5/11	47/48	5/7	9/19	4/11
XLIX	6 1/8	3	2	1 1/2	1	7/9	1/2	3/8
L	6 1/4	3 1/8	2	1 5/9	1	4/5	1/2	3/8
LIJ	6 1/2	3 1/4	2 1/6	1 5/8	1 1/12	4/5	5/9	2/5
LIV	6 3/4	3 3/8	2 1/4	1 7/10	1 1/8	5/6	4/7	3/7
LVJ	7	3 1/2	2 1/3	1 3/4	1 1/6	7/8	7/12	4/9
LVIIJ	7 1/4	3 5/8	2 2/5	1 4/5	1 1/5	10/11	3/5	6/13
LX (ʒj)	7 1/2	3 3/4	2 1/2	1 7/8	1 1/4	15/16	5/8	7/15
ʒIss	11 1/4	5 5/8	3 3/4	2 9/11	1 7/8	1 2/5	15/16	7/10
ʒIJ	15	7 1/2	5	3 3/4	2 1/2	1 7/8	1 1/4	15/16
ʒIJss	18 3/4	9 3/8	6 1/4	4 9/13	3 1/8	2 1/3	1 5/9	1 1/6
ʒIIJ	22 1/2	11 1/4	7 1/2	5 5/8	3 3/4	2 4/5	1 7/8	1 2/5
ʒIIJss	26 1/4	13 1/8	8 3/4	6 5/9	4 3/8	3 2/7	2 1/5	1 5/8
ʒIV	30	15	10	7 1/2	5	3 3/4	2 1/2	1 7/8
ʒV	27 1/2	18 3/4	12 1/2	9 3/8	6 1/4	4 2/3	3 1/8	2 1/3
ʒVJ	45	22 1/2	15	11 1/4	7 1/2	5 5/8	3 3/4	2 4/5
ʒVIJ	52 1/2	26 1/4	17 1/2	13 1/8	8 3/4	6 5/9	4 3/8	3 2/7
ʒVIIJ (℥J)	60	30	20	15	10	7 1/2	5	3 3/4
ʒVIIIss	63 3/4	31 7/8	21 1/4	16	10 5/8	8	5 1/4	4
ʒIX	67 1/2	33 3/4	22 1/2	16 7/8	11 1/4	8 7/16	5 5/8	4 1/4
ʒX	75	37 1/2	25	18 3/4	12 1/2	9 3/8	6 1/4	4 11/16
ʒXJ	82 1/2	41 1/4	27 1/2	20 5/8	13 3/4	10 5/16	6 7/8	5 1/6
ʒXIJ (℥Iss)	90	45	30	22 1/2	15	11 1/4	7 1/2	5 5/8
ʒXIV	105	52 1/2	35	26 1/4	17 1/2	13 1/8	8 3/4	6 5/9
ʒXVJ (℥IJ)	120	60	40	30	20	15	10	7 1/2

Explanation.—*In writing a prescription* look for the dose of the ingredient (say 1/20 grain) in the column headed by the size of your mixture (6 ounces); then on that line, in the left marginal column, is the quantity (2 1/2 grains) you must put into the entire mixture to get your dose in each dram thereof. *In reading a prescription* find the quantity of any ingredient called for in the left marginal column (say 3/4 grain), and on the same line, in the column headed by the number of ounces in the mixture (3 ounces), you will find the quantity (1/32 grain) in each dram dose. Of course, when the dose is more or less than 1 dram, the result must be proportionately multiplied or divided accordingly.

As the result of the above is nearly identical with the official preparation, we might write the same prescription more simply, as follows:

℞. Infusi Sennæ Compos., ℥ viij.

with the proper superscription and signature; this being the manner of prescribing the official preparations.

A rule for writing a prescription in metric terms by one who is not practised in the use of the system is the following, by Potter:

Write as though prescribing but one dose of each ingredient in grains or minims and decimals thereof; then substitute the term "grams" or "cubic centimeters" for grains or minims, and the prescription is correct for 15 doses in metric terms.

Of course, when writing for a mixture or solution, the proper quantity of vehicle must be added to complete the one dose, and must also be expressed first in grains or minims. For example:

	One Dose.	15 Doses Metric.	
℞. Quininæ sulphatis,	gr. j,	1	
Strychninæ sulphatis,	gr. $\frac{1}{64}$ or 0.016,		016
Fluidextr. glycyrrhizæ,	♏ iv,	4	
Syrupi,	♏ lx,	60	

This gives a two-ounce mixture approximately, of which the dose would be a teaspoonful.

	One Dose.	15 Doses Metric.	
℞. Quininæ sulphatis,	gr. j,	1	
Massæ ferri carb.,	gr. ij,	2	
Extr. nucis vomicæ,	gr. $\frac{1}{4}$ or 0.25,		25

Ft. pil. no. xv.

Sig.—One pill thrice daily after meals.

See Dosage; Latin (Medical); Incompatibility.

PRESENTATIONS, FETAL.—See Fetus (Position and Presentation).

PRESSURE.—Pressure is a less ambiguous term than compress or compression. Illustrations of the mechanic uses of pressure are: Coaptation of divided parts, crushing and dispersion of a ganglion on the wrist, truss retention of hernia, dilatation of strictures by bougies, and injections of air or oil by the rectum in cases of intussusception. The therapeutic uses of pressure, in combination with immobility and rest, antiseptics, and styptics are hemostatic, antispasmodic, and antiphlogistic in nature. In arresting hemorrhage, by most methods, in preventing and in treating acute inflammation when from a bruise or injury to a joint, gentle, equable, and elastic pressure conduces powerfully to the balance of innervation and circulation. In chronic inflammation pressure is a powerful agent. The patient's comfort is the usual measure of the degree of pressure in each case. When pressure causes pain, it must at once be lessened. Well-adjusted and elastic pressure is of service in the treatment of simple flesh wounds, complicated fractures, ingrowing toe-nail, in burns, bubo, carbuncle, whitlow, and arthritis. Bandaging is the most usual form of applying pressure, with or without padding, while elastic bandages, india-rubber strapping, air-cushions and water-cushions, and bags filled with sand or shot are other means. Digital pressure may sometimes be useful in compressing an artery. Successive layers of collodion make considerable pressure.

PRESSURE SYMPTOMS.—1. Nervous symptoms due to pressure upon the brain or spinal cord. In general if the pressure is light, the symptoms are those of irritation of the area pressed upon, manifesting themselves as spasmodic movements, tonicity of the muscles, pain, hyperesthesia, etc.; if the pressure is great, there results paralysis—motor or sensory or both—of the parts innervated by the areas pressed upon. See Brain, Spinal Cord. 2. The symptoms produced by an aneurysm or a tumor, as of the pelvis, adjacent organs being impinged upon.

PRIAPISM.—See Penis, Spine (Injuries).

PRICKLY HEAT.—See Sweat Glands.

PRISMS.—See Eye-muscles.

PROCTITIS.—See Rectum (Inflammation).

PROCTOCLYSIS.—Continuous rectal irrigation, popularized by Murphy, has proved of inestimable value in the treatment of peritonitis, hemorrhage, and shock. It is also recommended in typhoid, scarlatina, eclampsia, and the first stage of pneumonia. The nozzle of the apparatus is bent in order that it may be inserted without pressure against the posterior rectal wall as the patient sits up in bed. An adhesive strip fastens the tube to the thigh. The tube may remain in position several days. Murphy introduces a pint and a half of the solution (1 dram each of sodium chlorid and calcium chlorid to the pint of water) into the rectum in about an hour, then after an interval of an hour, a similar quantity is introduced. A modified form of irrigator has an electric heater attached to the douche so that the water entering the rectum can be kept at a constant temperature of 100° F. Saline solution may be administered by the drop method by means of a special instrument, containing a glass sight tube and a hard rubber regulator, designed to eliminate the disadvantages of the continuous flow method (back flow of fluid, regurgitation of feces, difficult retention of fluid in some cases). Through this contrivance, too, gases can readily escape. The Elbrecht apparatus, recommended by Dr. Murphy as fulfilling all indications, is adapted for either the continuous or the drop method. See Peritonitis.

PROFESSIONAL NEUROSIS.—A neurosis caused by continuous exercise of one set of muscles. See Occupation Neuroses.

PROGRESSIVE MUSCULAR ATROPHY.—Chronic anterior poliomyelitis in which the large ganglion cells of the anterior horns, the motor and trophic cells of the muscles, are gradually destroyed. See Muscles (Atrophy).

PROLAPSE.—See Anus, Ovary, Rectum, Umbilical Cord, Uterus, etc.

PROSTATE GLAND, HYPERTROPHY.—The term hypertrophy of the prostate is applied to that form of enlargement of the gland which takes place after middle life, rarely before the fiftieth year, and more frequently after the age of 60, developing slowly and without inflammatory symptoms. The enlargement may be general, affecting the entire organ equally, or it may take the form of a circumscribed growth involving only one portion of the gland. Thus, the so-called middle lobe alone may be involved. Overgrowth in this situation may take the form of a pedunculated tumor or of a sessile hypertrophy. In other cases there is a hyperplasia of the lateral lobes without any involvement whatever of the median portion. Sometimes one lateral mass is much more affected than the other.

In one form of this affection there is a marked overgrowth in a transverse direction, just at the vesical orifice, which gives rise to an upward projection that offers a great impediment to the emptying of the bladder. To this particular condition the term "collar" has been applied. There are two distinct types of prostatic hypertrophy. In one the overgrowth affects chiefly or entirely the glandular elements, forming a tumor of the type of the adenomata. In the other form the increase affects the stroma, which results in the formation of a fibroma-like tumor. Between these two types there is every gradation of simultaneous involvement of both gland and stroma.

Etiology.—The etiology of this form of prostatic enlargement has not been definitely determined. Many theories have been advanced, but, so far, none of them is susceptible of complete demonstration. Thus Launois advanced the hypothesis that the condition is merely a part of a universal arteriosclerosis, or local sclerosis affecting the urinary organs, and Ciechanowski endeavored to prove that it is the terminal result of chronic gonorrheal inflammation. Neither of these theories, however, has been generally accepted, and in fact good evidence has been adduced to show that they are wrong. Other supposed causes such as chronic constipation, sexual excesses, gout, rheumatism, the abuse of alcohol, etc., are so fanciful as to require no consideration whatever.

Symptoms.—The symptoms of enlargement of the prostate are not referred to the organ itself, but to the function of urination. In a certain percentage of cases with a moderate degree of hypertrophy there will be no symptoms to direct the patient's attention to the presence of this condition. As the overgrowth is of slow and gradual formation, so the symptoms are usually so insidious that the patient does not notice the change until the condition is well advanced. Usually, the earliest symptom is an increase in the frequency of urination. The difference in the beginning is very slight, but as the condition goes from bad to worse, the patient may be called upon to empty the bladder as often as every hour, half-hour, or even 15 minutes. In some cases this increased frequency is more particularly noted during the hours of sleep. There is also more or less hesitation in the beginning of micturition and absence of the usual force, which results in the loss of the usual parabolic curve, and, finally, an incomplete stoppage. Pain is a marked symptom in some instances, and is absent in others. It is particularly marked in the cases complicated with acute inflammation of the bladder. Some forms of prostatic hypertrophy obstruct the outflow of urine to a marked degree, while others seem to offer no obstacle to this function. In the former class the patient is unable entirely to empty the bladder. The urine that remains after the patient passes as much as possible is termed "residual." In some instances the patient is unable to void any urine voluntarily; in other cases it collects until the bladder is filled to its utmost capacity, after which there is an involuntary "dribbling," which flows as fast as the secretion is discharged from the kidneys. If cystitis is superadded, the urine will contain pus and mucus proportionate in amount to the grade of the inflammation, and blood will very frequently be present also. In a few cases the very first symptom will be absolute retention, which is the result of cold or some other condition, producing an acute congestion of a gland already the seat of a marked hypertrophy.

Diagnosis.—The diagnosis of hypertrophy of the prostate is usually to be made by digital palpation through the rectum. This examination reveals enlargement of the lateral lobes only, but will not always detect with certainty an overgrowth of the median portion. It is necessary, however, to exclude other sources of obstruction and other disturbances of the function of urination. Among the conditions from which prostatic enlargement is to be distinguished are: Stricture of the urethra, atony and paralysis of the bladder, tumor of the bladder, calculus, and cystitis. Stricture of the urethra will be detected readily by the usual examination for this condition. Atony of the bladder results from prolonged overdistention or from profound depression of the general health. Paralysis of the bladder would be accompanied by other evidences of degenerative changes in the spinal cord. Tumors of the bladder and tuberculosis are more difficult to distinguish from hypertrophy of the prostrate. A careful study of the history and the symptoms is necessary, and, finally, the usual examination for the latter condition will generally enable one to determine its presence or absence. Vesical calculus will be detected by careful examination with the proper instrument. It should not be forgotten, however, that vesical calculus and prostatic hypertrophy frequently coexist, the latter condition predisposing to the formation of stone. The differentiation from simple cystitis must be made again by excluding enlargement of the prostate.

The positive evidence of prostatic enlargement is determined, as already indicated, by digital examination through the rectum, and, in addition, by careful instrumental examination of the urethra. In making the latter examination the following points should be noted: (1) The distance the catheter passes before urine begins to flow; (2) whether the point of the catheter deviates to either side or is otherwise obstructed as it reaches the prostatic portion of the urethra; and (3) whether it is necessary to depress the shaft more than usual between the thighs before the point of the instrument enters the bladder.

This exploration is in most instances best made with a full-sized metal catheter (24 to 28 of the French scale) that has been properly sterilized and lubricated. It is also necessary to pass a catheter immediately after the patient has voided as much urine as possible voluntarily, in order to determine whether there is any residual urine. If the catheter passes freely and if urine is withdrawn when the instrument has been passed 7 1/2 inches, it is to be presumed that marked enlargement does not exist. If it is necessary to introduce a catheter 8 or 9 inches, or even further, before urine flows, and if, in addition, it is necessary to depress the shaft forcibly, prostatic enlargement is probably present. In certain cases it will be found impossible to introduce the ordinary form of metal catheter. In these cases it will be necessary to employ the metal "prostatic" catheter, which has a larger curve and a longer shaft than the ordinary instrument. In other instances, on account of the irregular overgrowth and consequent tortuosity of the urethra, some of the forms of flexible catheters must be employed. The information obtained by the foregoing examination will be confirmed or disproved by digital examination through the rectum. In making this examination the patient should lie in the dorsal position. The middle finger is the most suitable for this exploration. The physician should, of course, be familiar with the size of a normal prostate—which is usually described as being about that of the common horse-chestnut—in order to detect the presence of any enlargement. It is well, at the same time, to determine as far as possible the character of the growth, whether uniform or affecting principally one lateral lobe; and also whether it is hard or soft, hardness indicating fibrous overgrowth and softness glandular hypertrophy. Every grade of hypertrophy exists, from a degree scarcely to be detected, to the size of an orange or even larger. A gland that is twice the normal size must be considered the seat of distinct enlargement. It is to be remembered that the degree of obstruction and the urgency of the other symptoms do not depend entirely upon the extent of the enlargement.

The cystoscope, if skilfully used, will impart much information concerning the condition of the prostate. The projection of the enlarged gland into the bladder can be plainly seen, as can also the narrow channel formed by the convergence of the right and left lobes toward the median line; in lesser degrees of hypertrophy the irregular margin of the sphincter is shown. The so-called third lobe may also be distinctly seen, jutting out into the bladder. In addition the state of the bladder may be ascertained.

Treatment.—The treatment of these cases is to be determined by the symptoms and not by the degree of the enlargement of the prostate. As in the treatment of every other condition, no rules can be given that will be of universal applicability. Particular indications must always receive due consideration. Casper has truly stated that great knowledge and much patience is required of the surgeon who assumes the responsibility of treating prostatic cases. Attention to hygiene is of great importance. The diet should be plain but nutritious, a moderate amount of exercise taken, the bowels kept regular, and everything known to predispose to congestion and engorgement of the prostate avoided. Consequently exposure to cold and dampness must be guarded against as it often precipitates an attack of acute retention. Many prostatics get along excellently by following this regimen of living. If in course of time occasional attacks of pain, strangury and difficulty in urinating occur, relief will often be afforded by rest in bed, the use of hot applications to the hypogastrium, together with hot sitz-baths and the internal administration of anodynes and urinary antiseptics. In these attacks of incomplete retention recourse to the catheter is frequently necessary, but there are cases, as already stated, in which the trouble subsides promptly under the treatment above indicated.

In cases of complete retention regular catheterization must of course be practised. Great care is necessary in this procedure, which must be carried out under the strictest aseptic precautions, with the greatest gentleness, and by means of properly selected instruments. As a rule soft catheters should be used, and of these the French silk-web ones are an excellent type. The preliminary injection of a weak cocain and adrenalin solution, followed by an injection of warm sterilized olive oil or 20 percent gomenol oil, just before the catheter is inserted into the urethra, will facilitate the passage of the instrument and also lessen the pain incident to the procedure. In exceptional cases other instruments such as Mercier's, Guyon's, Brodie's, or an ordinary English catheter bent to a certain curve, will render good service, but it is advisable that they be used only by one who is well skilled in the manipulation of urethral instruments, lest a false passage be made. After the urine is withdrawn the bladder may be washed out with hot normal salt solution. A saturated solution of boric acid or weak permanganate solution, for instance 1:8,000. In cases in which there is an associated purulent cystitis, nitrate of silver solution is of value.

For those patients who are more or less dependent upon the catheter, the internal administration of such drugs as urotropin, arbutin, salol, opium and hyoscyamus or belladonna will prove helpful if they are selected in accordance with the indications present in the individual case. They are especially valuable during temporary retention in the comparatively early cases as they render the urine aseptic and relieve irritability and pain. Permanent catheterization is of decided value in certain cases, but no fixed rules can be laid down with regard to its employment. When the passage of an instrument is very painful to a patient suffering with prolonged complete retention, the permanent catheter may be tried. If it produces so much irritation that the patient cannot be made comfortable with a moderate amount of opium, it is well to discontinue its use. Patients vary greatly with reference to their toleration of this instrument, and each case must be decided upon its own merits.

Acute complete retention may demand capillary puncture of the bladder if an instument cannot be passed through the urethra after a reasonable effort has been made to get one through. This little operation is free from danger. The skin is incised above the symphysis and the trocar plunged quickly and forcibly downward and backward.

With regard to operative treatment suprapubic and perineal prostatectomy chiefly require consideration. They are to be welcomed as a decided advance in the therapy of prostatic hypertrophy, inasmuch as they afford relief in a class of cases not otherwise amenable to treatment. They are not without danger, however, and therefore should not be employed indiscriminately nor undertaken lightly, being reserved for those cases in which milder measures prove futile (Casper).

When catheterization fails or has to be frequently repeated owing to smallness of the bladder produced by thickening of its walls, when it is very painful or is followed by hemorrhage, and when severe cystitis is present or frequent attacks of retention occur, then one of these radical operations is to be considered (Casper). Although both operations have ardent advocates, it is probable that each has its own particular sphere of applicability. Thus it may be stated that the large, soft adenomatous prostate which projects up into the bladder can be better attacked and removed through the suprapubic incision, and that the small, hard, fibrous prostate which does not rise into the bladder for any distance can be better removed by the perineal route. Naturally those operators who have had unusual experience in the performance of one or the other operation can do it successfully under conditions which would make its performance very difficult to a surgeon of less experience. The suprapubic operation still has a higher death rate than the perineal, but it is claimed by many that the results obtained by it are better and more permanent than those which follow the perineal operation.

The Bottini operation, or galvanoprostatotomy, is rarely employed at present. Casper states that as a rule it is only palliative, although in a few specially selected cases it affords permanent relief. Castration for the purpose of producing atrophy of the enlarged prostate is a relic of the past, and division of the vasa deferentia is employed only in case of patients who suffer from prostatism or recurring epididymitis due to catheterization. When advanced arteriosclerosis, grave cachexia, bilateral renal disease, or other serious organic trouble is present so that a radical operation is not possible relief may be obtained by the establishment of a suprapubic fistula.

PROSTATE GLAND, INFLAMMATION.—Inflammation of the prostate may be either *acute* or *chronic*. Two forms of each are described—namely, *follicular* and *parenchymatous*. In the former the pathologic process affects the follicles chiefly or solely, while in the latter all the structures of the organ are involved.

Acute Prostatitis.

Etiology.—Acute prostatitis probably does not occur as an "idiopathic" affection. Among the causes assigned are such external influences as exposure to cold and wet, and traumatism of the perineum; such local factors as injury from instrumentation, calculus, or foreign body; and such general conditions as gout and the acute infectious diseases. It is probable that all the cases are due to infection, and that the factors mentioned act chiefly by establishing a focus of diminished resistance. The majority of cases of inflammation of the prostate are secondary to extension backward of a specific urethritis. The prostate is also involved in some cases of cystitis, the condition being known as "prostatocystitis." Acute prostatitis may develop during the course of smallpox, scarlet fever, typhoid fever, typhus, etc., or it may occur as a sequel to one of these diseases. Prostatitis of tubercular origin is occasionally met with. There appears to be no evidence that horseback riding and bicycle riding, under proper conditions, have ever caused inflammation of the prostate. The cases that have been reported as originating from these causes may have depended upon other factors that were not manifest. This expression is not intended to convey the idea that the use of a saddle constructed upon principles that are grossly wrong anatomically and injudicious riding may not exert some unfavorable influence upon structures adjacent to the perineum. These are factors, however, that may be eliminated, and should not be allowed to weigh against the many advantages to be derived from judicious riding. It has seemed well to speak emphatically upon this point, inasmuch as the question is so frequently asked, and because some difference of opinion exists.

Symptoms.—The symptoms of acute prostatitis are: A sensation of heat and of weight in the perineum or in the rectum; micturition is more frequent than normal and may be attended with tenesmus; if there is great swelling of the gland, retention may result; pain soon becomes a prominent symptom and is frequently very severe—it may be throbbing in character, it is worse on motion, and the usual sitting position is uncomfortable if not impossible; a constipated stool is attended with very acute suffering; pressure on the perineum causes pain; digital examination of the prostate, per rectum, shows the gland to be somewhat enlarged and tense, and pressure causes very acute pain. There is always some constitutional disturbance in these cases; the temperature ranges from 100° to 103° F., and the pulse is proportionately accelerated.

In the higher grade of inflammation pus is likely to form. The occurrence of suppuration is often announced by a chill, and digital examination at this stage will sometimes reveal an area of softening at some point of the gland or distinct fluctuation may be felt. The abscess may remain localized until it is evacuated, it may discharge spontaneously, or the whole gland may break down rapidly. In connection with the last termination the constitutional disturbance is usually pronounced. Septicemia and pyemia are rare terminations of acute prostatitis, and are especially liable to occur in the cases in which the periprostatic tissues are involved with secondary thrombosis of the prostatic plexus of veins.

Diagnosis.—Acute prostatitis must be distinguished from acute posterior urethritis; from acute cystitis, especially that form affecting chiefly the vesical neck; from cowperitis, and from stricture of the urethra and hypertrophy of the prostate. Acute posterior urethritis may present all the urinary symptoms observed in acute prostatitis; the constitutional symptoms, which are usually marked in the latter, will, however, be absent, or nearly so, in the former; swelling and tenderness of the prostate, as determined by rectal palpation, will be absent in urethritis. Acute cystitis would likewise cause no change in the prostate gland; the condition of the prostate is the chief distinguishing feature between these two diseases. Cowperitis would be detected by the presence of a slight, very tender swelling on one side of the perineum (unless the disease were bilateral); the absence of change in the prostate would exclude inflammation of this structure.

Stricture of the urethra would not be accompanied by the local evidences of inflammation of the prostate gland or the accompanying febrile symptoms. Hypertrophy of the prostate almost never occurs before the age of 50, and is not usually observed until the sixtieth year or later. The absence of acute inflammatory symptoms would exclude acute prostatitis.

Treatment.—In common with all other acute inflammatory processes the treatment of acute prostatitis should include absolute rest and a position that will favor emptying the part of blood as much as possible. Therefore, rest in bed—with the hips elevated upon pillows to a higher level than the shoulders—is to be insisted upon. In the more acute cases the local abstraction of blood by means of leeches applied to the perineum and around the margin of the anus will be followed by marked amelioration of the pain. Hot sitz-baths or hot compresses applied to the hypogastrium and perineum act beneficially by withdrawing the blood from the deeper parts to the surface. Hot-water clysters are likewise useful.

If there is marked fever, a prescription similar to the following should be used:

℞.	Boric acid, Potassium bromid, } each,	ʒ j
	Potassium citrate,	ʒ ij
	Tincture of aconite,	♏ lxxij
	Tincture of belladonna,	ʒ ss
	Sweet spirit of niter,	℥ ss
	Water, add enough to make,	℥ vj.

One tablespoonful every 3 hours.

If pronounced vesical irritation is present, the administration of some such mixture as the following will give marked relief:

℞.	Boric acid, Sodium bromid, } each,	gr. clx
	Tincture of belladonna,	ʒ ss
	Solution of citrate of potassium, add enough to make	℥ viij.

One tablespoonful to be taken every 3 hours.

If the pain is severe, 1 grain of morphin sulphate may be added to the foregoing mixture with advantage, or suppositories may be administered. A common and useful formula for the latter is:

℞.	Extract of belladonna,	gr. iij
	Watery extract of opium,	gr. vj
	Cacao-butter, add enough to make 12 suppositories.	

One of these may be introduced into the rectum 2 or 3 times a day, according to the severity of the pain.

Straining, either at stool or during micturition, should be avoided, as it increases the congestion in and about the prostate and aggravates the symptoms. If the patient is unable to pass his urine naturally, it should be drawn, preferably with a Nélaton catheter of medium size (14 to 18 of the French scale). The bowels should be kept acting rather freely by the use of salines or other laxatives. The diet should be restricted to milk as nearly as possible. Stimulants should not be given unless indicated by some other condition, and then in moderation only.

If abscess of the prostate forms, the pus should be evacuated as soon as detected. The incision should be made through the perineum, except in those rare instances in which the pus appears just beneath the mucous membrane of the rectum, when the incision may be made in this situation. To reach a collection in the prostate through the perineum, the index-finger of the left hand should be introduced into the rectum and the abscess located; then a straight bistoury, with the cutting-edge directed upward, is introduced into the perineal raphe, about 3/4 of an inch anterior to the anus, and carried forward toward the tip of the finger in the rectum until the abscess is reached. Neither the urethra nor the rectum should be wounded in this operation. The incision should be enlarged upward sufficiently to give free exit to the pus. It is always well to explore with the finger, to be certain that the drainage is free, and also to break up any partitions that may exist. Thorough irrigation with an antiseptic solution and moderate packing with iodoform gauze complete the operation. In the event of profuse hemorrhage following the operation, the packing should be firm. The gauze should first be removed on the second or third day, after thorough soaking with antiseptic solution. The dressings are to be repeated daily thereafter. Sometimes a urethroperineal or a urethrorectal fistula will persist; but with proper attention to the care of the wound this will be rare. A prostatic abscess will usually be evacuated through the urethra, either spontaneously or as the result of passing a catheter. This is to be considered a favorable termination, but in severe cases with marked local and constitutional symptoms it is not proper to depend upon this event, and in such cases there are no exceptions to the rule to evacuate a prostatic abscess by incision as soon as it is detected.

Chronic Prostatitis.

Chronic prostatitis is a more common affection than the acute variety, but as the symptoms are much less prominent, many cases never come to the attention of the practitioner.

Etiology.—Chronic prostatitis either follows as a sequel to an acute inflammation of the gland, or it develops as a result of a long-continued or of frequently repeated prostatic congestion. Among the causes that induce chronic congestion in this region may be mentioned the prolonged use of irritating injections; excessive sexual excitement, however induced; hemorrhoids; exposure to cold; stricture of the urethra; vesical calculus; and injury with catheters and sounds. Probably the most common cause is gonorrheal infection.

Symptoms.—Chronic prostatitis usually gives rise to dull pains, deep in the perineum, and to reflex pains in the thighs and sacral region. There may be some increase in the frequency of urination, and slight pain at the end of the act. The prostate, as felt through the rectum, may be of normal size or slightly enlarged; there is usually moderate sensitiveness to pressure. The urine may be slightly cloudy, due to the presence of mucus or mucopus and epithelium derived from the prostatic urethra. With the last drops of urine sand-like particles, composed of phosphate and carbonate of lime are often expelled. It is supposed that they are forced out of the prostatic ducts by contraction of the sphincter muscle. Another symptom to which Casper has called attention is the occurrence of residual urine in young men in whom no cause for its existence can be found. He thinks it is due to contraction of the sphincter, as the result of which the bladder cannot empty itself. There may be imperfect erections, premature ejaculations, or nocturnal emissions. Sexual intercourse and pollutions are often painful. In addition to these symptoms many nervous phenomena occur, but they undoubtedly owe their existence to a concomitant neurosis rather than to the prostatitis.

Diagnosis.—The symptoms of chronic prostatitis as outlined are fairly characteristic. The following procedure is a valuable aid in the diagnosis of doubtful cases: The patient is requested to pass an ounce or two of urine in one vessel and an equal or greater amount in a second, but still to retain a portion of urine in the bladder. The prostate is then thoroughly expressed by massage from the rectum, either by the finger or with an instrument specially designed for the purpose; finally, the patient passes the last portion of urine. If chronic inflammation of the prostate exists, the last urine will contain shreds of mucus, pus, and epithelium, forced into the urethra from the prostatic glands by the massage. In applying this test care must be observed not to mistake chronic seminal vesiculitis for prostatitis. The distinction will be made by avoiding the seminal vesicles when massaging the prostate.

Treatment.—No treatment is rational that does not begin by removing the cause of the trouble as far as possible. Therefore, any condition that tends to keep up a congestion of the prostate should be removed. Phimosis, stricture of the urethra, constipation, and undue sexual excitement are among the common causes that should be looked for, and, if present, they should receive appropriate attention. The application of a jet of cold water to the perineum and about the anus twice daily will act efficiently in causing a reflex contraction of the prostatic vessels. Counterirritation to the perineum is also useful. It may be secured by the daily application of equal parts of tincture of iodin and tincture of belladonna, until the skin becomes somewhat tender, when it should be discontinued for a few days. The effect of a few drops of nitrate of silver deposited in the prostatic urethra two or three times weekly, by means of a long-nozzle syringe, will be beneficial in many cases. It is well to begin with a solution of the strength of 1/2 of 1 percent, as stronger applications are followed by severe reaction; the strength may be gradually increased with advantage. Massage of the prostate is probably the most efficient method of treatment at our command. It has been much neglected, undoubtedly because of the unpleasant features both to the patient and the surgeon. In applying the treatment the patient may be placed either on his back or in the knee-elbow posture. To carry out digital massage, the middle finger should be introduced into the rectum, and the gland rubbed from left to right, and from right to left, pressure being made toward the symphysis. The seance may last 5 or 10 minutes, and may be repeated every day or second day.

In addition the different functions of the body should receive careful attention. Tonics may be indicated, and the mental depression is most effectively treated by confidently reassuring the patient, and setting his mind straight, if he is laboring under mistaken ideas as to the source and significance of the different symptoms.

PROSTATORRHEA.—A condition in which the prostatic fluid is discharged during defecation or after micturition, or independently thereof. Associated nervous or hypochondriacal symptoms are usually present. Prostatorrhea is due to relaxation of the prostatic ducts, which may depend upon chronic gonorrheal inflammation, sexual excesses or masturbation. This condition is often confounded with chronic prostatitis but the two are independent of each other, although they may be co-existent. There are many cases of prostatorrhea in which the secretion contains no pus, and, on the other hand, there are many cases of prostatitis in which no signs of prostatorrhea are present. Treatment consists in the employment of local measures to relieve the congestion of the prostatic urethra and prostate gland. Chief among these may be mentioned the use of sounds, deep instillations of silver nitrate solution, and cool rectal douches. Attention to hygiene is important, and as a rule tonics, such as arsenic, iron and the simple bitters, will prove of value.

PROSTRATION.—See Collapse, Exhaustion, Neurasthenia, Shock.

PROTARGOL.—A proteid compound of silver containing 8 percent of the metal. It has many strong advocates as a substitute for silver nitrate. It is not so painful, is more germicidal, has greater penetrating powers, and does not form a precipitate with albumin. It has been used in all forms of conjunctivitis in strengths of from 2 percent to 50 percent. A 2 percent solution is generally used as a collyrium. Recently, there has been considerable dissent from the numerous favorable reports, and there has been an inclination to restrict its use to the milder inflammations of the conjunctiva.

PROTOZOA.—Unicellular organisms representing the lowest type of animal life. Of those that are parasitic in man the most important are: (1) The rhizopoda which include the *ameba coli*, the cause of amebic dysentery; (2) the flagellata, to which class belong the *trichomonas*, found most frequently in the vagina but also in the digestive tract and occasionally in the lungs, and the *trypanosomes* (see Sleeping-sickness); (3) the sporozoa which include the *coccidia*, and also the *hemosporidia* (to which belong the plasmodia of malaria). The spirocheta pallida of syphilis is believed to belong to the protozoa. It has been affirmed that molluscum contagiosum and carcinoma are due to protozoa, the cancer cells and the molluscum bodies being regarded as parasites. Smallpox is probably caused by a protozoon.

PRUNUS VIRGINIANA (Wild Cherry).—The bark of *P. serotina.* It contains tannin, gallic acid, resin, starch, etc., also *amygdalin* and *emulsin*, which by their mutual reaction in the presence of water, produce *hydrocyanic acid* and a *volatile oil* resembling that of bitter almond. The root-bark contains a glucosid, *phloridzin,* found also in the same part of the apple, pear and plum trees. Wild cherry is aromatic and feebly tonic; it is largely used in pulmonary tuberculosis to quiet the cough and to calm the nervous system; also in coughs of bronchitis. It is an ingredient of various proprietary cough mixtures. Dose of the bark, 20 to 45 grains; of the fluidextract, 20 to 40 minims; of a 4 percent infusion, 1/2 to 3 ounces; of a 15 percent syrup, 1/2 to 1 1/2 drams.

PRURIGO.—Prurigo is an inflammatory disease of the skin, characterized by the occurrence of pale red papules, from the size of a pinhead to that of a lentil seed, occurring chiefly upon the extensor surfaces of the extremities, beginning in infancy or early childhood, lasting for years or throughout a lifetime, and accompanied by intense itching.

Symptoms.—According to the severity of the disease, two types are distinguished—*prurigo ferox* (severe prurigo) and *prurigo mitis* (mild prurigo).

The disease usually begins in the first year of life, not infrequently taking the form of an ordinary urticaria. Later there appear upon the extensor surfaces of the legs and arms, the trunk, and sometimes the forehead, pinhead-sized or larger discrete, firm papules. These may be pale red or may have the natural color of the skin. The itching is intense, as a result of which the affected areas are covered with excoriations and blood crusts. After a time the skin becomes harsh, dry, greatly thickened, and sometimes pigmented. The neighboring lymphatic glands, particularly those in the inguinal regions, are often so greatly enlarged as to be apparent to the eye.

The disease is extremely rebellious, and may persist for years, or even throughout the entire lifetime of the individual. It is apt to undergo spontaneous improvement in the summer season. Prurigo is distinctly rare, particularly in this country.

Etiology and Pathology.—The disease is engendered by the environment of "misery," poor food, bad hygiene, etc. The pathology does not differ markedly from that of the chronic papular eczema.

Diagnosis.—The localization and character of the papules, the thickened skin, the marked adenopathy, the chronic course, and the history of the disease render its diagnosis easy.

Prognosis.—Severe cases often persist for a lifetime. Milder cases may, under judicious treatment, be cured. Some cases recover spontaneously at about the age of puberty.

Treatment.—The therapeutic indications are to relieve the intense itching, to get rid of the eruption, and to improve the general health. Nutritious food and proper hygiene are essentials. Tonics, such as iron, cod-liver oil, and the hypophosphites, are often indicated. Crocker recommends for the relief of itching the tincture of cannabis indica, beginning with 5-minim doses—in a child of 8, for instance—and increasing to the physiologic limit.

Locally, ointments of beta-naphthol, sulphur (1 dram to the ounce), and tar are of value.

Kaposi strongly advocates the following:

℞. Beta-naphthol,	gr. x to xxx
Petrolatum,	℥ j.

Rub in each night.

Baths are extremely useful, particularly the alkaline bath (sodium carbonate, 4 ounces to 30 gallons of water) and the sulphur bath (precipitated sulphur or potassium sulphid, 4 ounces to 30 gallons of water).

PRURITUS.—Pruritus is a functional cutaneous disorder characterized by itching, without structural alteration of the skin.

Symptoms.—Itching is the sole symptom—it may be of a tickling, pricking, crawling, or tingling character. The patient is invariably prompted to scratch and rub the affected part. As a result of long-continued scratching, excoriations, papules, and thickening of the skin may result. The itching is paroxysmal, and nearly always worse at night.

Pruritus may be general (*pruritus universalis*) or local (*pruritus localis*). The regions commonly attacked in the latter variety are the anus (*pru-*

ritus ani), the vulva (*pruritus vulvæ*), and the scrotum (*pruritus scroti*).

Pruritus is far more common in advanced life (*pruritus senilis*).

The form of pruritus occurring during the cold months of the year is designated *pruritus hiemalis*.

Etiology.—Generalized pruritus may be caused by Bright's disease, diabetes, hepatic affections, digestive and intestinal disturbances, nervous disorders, pregnancy, uterine and ovarian disease, ingestion of certain medicaments, etc.

Pruritus vulvæ is not infrequently produced by irritating vaginal discharges. It is a common symptom in diabetes. Pruritus ani may be caused by hemorrhoids, fissures, seat-worms, etc., or may be due to digestional disorders, gout, or some other constitutional condition.

Diagnosis.—Pediculosis corporis may usually be differentiated from pruritus by the localization of the scratch marks and the presence of the parasites in the garments.

Prognosis.—Guarded. Depends upon the nature and removability of the cause.

Treatment.—The cause must be assiduously investigated and treated.

Internal Treatment.—Diet and hygiene should be carefully regulated. The various visceral diseases must receive appropriate treatment. In obscure cases the mineral acids, quinin, strychnin, atropin, gelsemium, pilocarpin, and arsenic may be variously tested.

Local treatment is designed to give merely temporary relief from the distressing itching.

The following are some of the best antipruritic lotions:

℞.	Phenol,	ʒ j to iij
	Glycerin,	ʒ ij
	Alcohol,	℥ iv
	Water, add enough to make	O j.

℞.	Liquor carbonis detergens,	℥ ss to ij
	Water,	O j.

℞.	Thymol,	ʒ ss to ij
	Solution of potassa,	ʒ ij
	Glycerin,	℥ ss
	Water,	O j.

For pruritus vulvæ one may use: (1) Saturated solution of boric acid; (2) compound tincture of benzoin (painted on); (3) vaginal injections of alum, zinc sulphate, etc.

For pruritus ani:

℞.	Phenol,	gr. x to xx
	Calomel,	gr. xx to xxx
	Zinc oxid ointment,	℥ j.

℞.	Mercuric chlorid,	gr. viij to xvj
	Water,	℥ viij.

℞.	Morphin sulphate,	gr. x
	Flexible collodion,	℥ j.

See Anus, Vulva.

PRUSSIC ACID.—See Cyanids.

PSAMMOMA (**Sand Tumor**).—A fibrosarcoma, containing calcareous material, observed rarely in the meninges, pineal gland and choroid plexus.

PSEUDOCYESIS (**False Pregnancy**).—The belief in the existence of pregnancy on the part of a woman, accompanied, perhaps, by more or less vague subjective signs. This condition occurs in nervous, hysteric women as a rule. It is seen most frequently in unmarried girls who fear the results of illicit sexual connection, or in sterile married women who are approaching the menopause and who very much desire offspring.

It is accompanied usually by such common symptoms of pregnancy as nausea, enlargement of the abdomen, and sometimes cessation of menstruation. A careful vaginal examination (preferably with the aid of anesthesia), will reveal an absence of the characteristic signs of true pregnancy.

Treatment should be directed toward the general nervous condition. Sedatives, tonics, and change of food, air, and scene will be found most beneficial.

PSEUDOLALIA.—See Speech Defects.

PSEUDOLEUKEMIA.—See Lymphadenoma.

PSEUDOLEUKEMIA, SPLENIC.—See Splenic Anemia.

PSEUDOLEUKEMIC ANEMIA OF INFANCY.—A chronic anemia of infants and young children described by von Jaksch, characterized by marked leukocytosis and marked reduction in the red cells and hemoglobin, greatly enlarged spleen, sometimes moderately enlarged liver with sharp edges and at times enlarged lymphatic glands. The disease is not to be confounded with pseudoleukemia, in which there is no leukocytosis, nor with leukemia, in which there is not so marked a reduction of hemoglobin or in the number of red cells but a greater increase in the number of leukocytes. The leukocytes are characterized by their varied shape and unusual size. The red cells display a high degree of poikilocytosis, while white cells inclosing red cells and fragments of red cells are also found, together with occasional eosinophilic leukocytes and large multinuclear neutrophilic leukocytes and nucleated red cells. All of these modifications of the blood-corpuscles, however, may occur in leukemia. Prognosis is only guardedly favorable, for death often occurs from intercurrent disease.

PSILOSIS.—See Sprue.

PSOAS ABSCESS.—Chronic collections of tuberculous fluid, which form in the cellular substance of the loins, behind the peritoneum, and descend in the course of the psoas muscle; if the disease forms on the side of the vertebræ, instead of the fore part, it is termed lumbar abscess.

Etiology.—This disease arises generally from cold, strains, or falls, and from general debility, and not infrequently from spinal affections.

Symptoms.—At the beginning there is little or no pain, no inflammation, nor is there febrile disturbance; but previous to the appearance of any other symptom the patient has an unaccountable feeling of weakness across the loins, accompanied by pains, usually giving no indication of the seat of the disease, and likely to be regarded as rheumatic. The tuberculous fluid is formed slowly and imperceptibly, and occasions, at first, no manifest swelling or fluctuation. When the lower dorsal or upper lumbar vertebræ are diseased, the pus enters the sheath of the psoas, or the substance of the muscle, and is firmly bound down in front by the fascia covering this muscle and the iliacus. The abscess proceeds as far as the tendon of the muscle by Poupart's ligament, where its further progress will probably be arrested. When it has attained considerable magnitude, it passes under Poupart's ligament, between the femoral vein and the symphysis pubis.

The diagnosis is difficult when the abscess is unattended by an external tumor. The swelling takes place in various situations and assumes different aspects; it may appear beneath the femoral fascia, or it may descend as far as the knee and form a prominent swelling; sometimes it will make its way downward into the pelvis and occasion a swelling in the neighborhood of the anus, or it may appear in the vicinity of the vertebræ, or, again, it may make its may through the abdominal muscles.

Treatment.—A psoas abscess should be opened, if possible, before it leaves the abdomen, just about Poupart's ligament, external to the line of the vessels. If it points at the inner side of the thigh, an incision may be made in that situation, in addition to the one above Poupart's ligament. Under antiseptic precautions, the sooner the abscess is opened, the better, for the abscess cavity is then smaller than if the surgeon waits until the fluid has burrowed its way into the thigh. Free drainage should be established from the groin to the lumbar region. The same principal of treatment must be applied to lumbar abscesses. Antiseptic dressings must be continued as long as there is discharge. General tonic and alterative treatment is indicated. See also SPINE (Caries).

PSORIASIS.—A common chronic inflammatory disease of the skin, characterized by variously sized lesions, having red bases, covered with white scales resembling mother-of-pearl. It affects by preference the extensor surfaces of the body. The lesions are infiltrated, elevated, clearly defined, covered with white, shining, easily detachable scales which, upon removal, reveal a red, punctate, bleeding surface. The eruption is absolutely dry, and itching is usually absent. The recognition of psoriasis depends upon a clear comprehension of the many manifestations exhibited by this cutaneous affection. The lesions observed in the early stages of an attack may not always be sufficiently distinct to the casual observer to obviate error. Those noted in the later periods of the condition are usually characteristic.

Symptoms.—Early in its inception psoriasis is observed to present lesions of a papular nature and of diminutive size. Scattered here and there over the body surface there are noted pinhead-sized or smaller lesions, each of which very early in its life becomes tipped with a minute scale of a pearly white color. They are slightly raised above the surrounding healthy skin, and while showing a pinkish-red coloration directly at the point of attack, the amount of inflammation is not of a high grade, and does not extend beyond the borders of the individual papule. Enlarging by gradual peripheral extension—either slowly or quickly—they soon become easily discernible and characteristic.

Later in their course they have been known to attain varying dimensions—from the diminutive lesion to those occupying areas one inch or more in diameter, or when two or more in close proximity have coalesced, forming patches the size of one's hand, or even covering the greater part of one limb, or occasionally the major part of the back or chest. The edges of these lesions are distinct and stand out prominently, being, with the entire patch, raised somewhat above the surrounding areas. They are always dry and covered with abundant, pearly white, shining scales, which are arranged one upon the other in an imbricated manner. The removal of the scale often presents some bleeding points upon the affected areas. The patches often assume grotesque outlines—being in some instances annular or circinate, and in still others semicircular or arranged in bands—to each of which descriptive names are applied. Although rarely giving sensitive impression of their existence, they occasionally give rise to intolerable itching in certain nervous constitutions.

Psoriasis may remain stationary at any stage of its process, but, generally seen, all stages may be depicted in any given case. While the affection may be observed at any point of the body surface, it usually accepts certain points, such as the scalp, elbows, and knees, as its most formidable positions. It may be observed at any age, although early adult life presents the greater number.

Diagnosis.—The special points of value in reference to diagnosis are: Lesions of variable dimensions, all being capped with the pearly white scales; borders severely outlined; tendency to coalescence, with the presentation of bleeding points upon removal of scale.

In differentiating psoriasis from **eczema** care should be exerted to observe the dry character of lesions which are scattered over the entire body surface; their tendency to coalescence, with the appearance of characteristic scale; the chronic course, with existence of but slight, if any, itching; the well-marked borders and regularly rounded outline of each lesion. In eczema there is always a history of moisture, with occasionally crusting and scaling; the patches always fade into surrounding areas, and are continually changing; itching is usually severe, while the inflammation is more of an acute nature.

In contradistinction to **syphilis**, psoriasis gives no history of initial lesion; there is no enlargement of glandular structures; lesions are symmetric, present a tendency to uniformity and coalescence, with abundance of pearly white scaling. Itching is occasionally present, although of but slight degree. Syphilis presents a history of contamination, with enlargement of cervical, inguinal, and epitrochlear glands. The lesions are asymmetric and multiform, but retain their contour. Itching is not a usual accompaniment. The scale is of a grayish tint.

Erythematous lupus is more often limited to the face and neck. The lesions number but two or three, are paler in tint, and covered with a fine yellowish or grayish scale; the center is depressed beneath the surrounding edge of the patch, and is more whitish in appearance than surrounding healthy areas. Upon removal of the scale, small sebaceous plugs may be observed emerging from the follicles.

Tinea circinata rarely occurs over a great surface. It is an acute affection, and gives a history of contagion. Lesions are usually annular, and extend upon the periphery while the center is healing. Vesicles may often be noted upon their periphery. Psoriasis, while clearing in the center, presents a tendency to peripheral disappearance.

Treatment.—While internal and external measures may both be demanded in most of the cases of this affection, there are many in which either plan may prove curative, and therefore it is advisable to acquaint one's self with the therapeutic agents of both classes.

Internal Treatment.—By far the greatest benefit may be received from the use of aresenic in one of its many forms; and while it has been supposed to possess specific properties for the removal of this affection, this cannot be proved, on account of its many failures. In the choice of this remedy it is advisable to select those cases in which there is not decided inflammation, as is often encountered in its early history, or those more chronic, wherein the drug has not been used. Arsenic seems to lose its power over the affection when used continuously or when repeated attacks are placed under its influence. One of the following plans may often prove beneficial: In one set of cases the best results follow the administration of 4 or 5 drops of the solution of arsenite of potassium, given 3 times daily for an indefinite period (arsenous acid, in doses of 1/20 grain, possesses a similar property). In another set of cases it may be found advantageous to increase the dose by 1 drop daily until near a point of tolerance, but not reaching that point.

Cod-liver oil is efficacious in cases of lowered vitality, and is best administered in the maximum dose, according to the age of the affected individual. The oil of copaiba, in doses of from 5 to 30 drops, thrice daily, may be most judiciously advised in many cases of long standing or when the degree of inflammation is high. Potassium iodid, in 5-grain or 10-grain doses, given for indefinite period; the salicylates, in similar dosage, produce good effects. Iron and strong tonics are demanded in certain depressed constitutions. Numerous other drugs are omitted, owing to the many chances of failure following their use.

Sea-water injections are said to have been used with some success.

External Treatment.—The first essential point in the external treatment is the removal of the scales; and to accomplish this, recourse must be had to the use of either baths or emollients. The ordinary bicarbonate of sodium or, preferably, the carbonate of potassium may be used in strengths varying from 1 to 3 ounces to each bath of 30 gallons. Olive oil or liquid petrolatum may produce a similar effect, possibly without fear of irritation in injudicious subjects.

Ordinary soap and water, applied thoroughly by means of a coarse towel, may likewise remove the abundance of scales, and thus present a clear base upon which to apply the chosen unguent. It may be found advisable to apply one of these measures frequently during the treatment of a case, owing to the tendency to reaccumulation of scales.

Ointments or pigments may possibly be the preferable plan of using external drugs, although liquid applications may give as good results. Salicylic acid, in from 3 to 10 percent ointments, with petrolatum applied twice daily, may be satisfactorily borne by many patients, but care must be exerted not to produce too much irritation of the underlying skin or contiguous parts. Tar—in the form of the oil of cade, oil of birch, or ordinary liquid tar—in the proportion of 1 or 2 drams to the ounce of ointment, may be judiciously advised in many long-standing cases. Ichthyol proves beneficial in many instances, and may be used in strengths varying from 1 to 3 drams to the ounce, and applied once daily during the whole course of the disease. This class of remedies may also be used in watery solutions, in strengths similar to those mentioned.

Chrysarobin produces excellent results in ointment form, in the strength of from 10 to 60 grains to the ounce of petrolatum, in those cases wherein much thickening has been induced by the process. It may also produce good effects when applied dissolved in the strength of from 10 to 60 grains to the ounce of either traumaticin or chloroform. Either of these plans will demand careful attention, owing to the inflammation that may be induced; and if applied near the eye, violent iritis may follow.

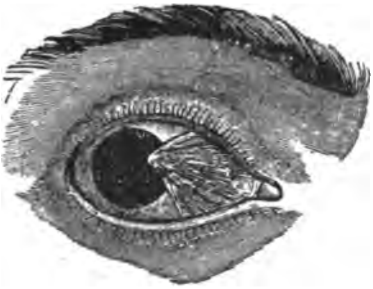
Pyrogallic acid may be used advantageously in a manner similar to the foregoing, and with less likelihood of producing ill effects. When psoriasis is observed upon the face or upon other visible parts of the body surface, it should be treated by some form of inunction, such as by ammoniated mercury, that does not give evidence of its presence. This remedy, used in the strength of from 10 to 40 grains to the ounce of petrolatum, will usually suffice.

PSOROSPERMIASIS.—Psorosperms (sporozoa, cytozoa) belong to the lowest forms of the protozoa. The most important psorosperms are the *coccidium cuniculi* and the *coccidium hominis*. The latter is reported to have caused a few cases of intestinal disease in man. The former has been found in man usually in the liver. Its presence gives rise to inflammation of the ducts followed by the formation of tumor-like nodules with a cheesy center containing pus, débris, coccidia and shed epithelial cells. These nodules with the massing of epithelial cells have led to the opinion that they are associated with cancer formations. The cutaneous lesions that sometimes occur simulate verrucose tuberculosis, mycosis fungoides or carcinoma.

PSYCHOSIS POLYNEURITICA (Korsakow's

Psychosis, Polyneuritis).—See Multiple Neuritis.

PTERYGIUM.—A triangular patch of thickened conjunctiva, most common on the nasal side; the apex of the growth points toward the pupil, and the fan-shaped base radiates toward the canthus. As it continues to grow it resembles a mass of flesh; and as years go on it partly atrophies, becomes pale, and appears tendinous. It is loosely attached at the limbus, and in this position a probe can be passed under its edges. On the cornea the growth is firmly adherent and must be torn or dissected away. If the pterygium grows over the cornea, it may drag the conjunctiva and caruncle with it to such a degree as to interfere with the movements of the eyeball, besides becoming unsightly. This affection is frequently found in elderly persons who have endured exposure in years of outdoor occupation. It is common in sailors. One eye is usually affected, although the growth has been seen simultaneously in both eyes, and in rare instances has developed from the outer canthus.



Pterygium.

Treatment.—If the growth has not extended upon the cornea and shows no sign of progression, it may be left undisturbed. A flat, stringy head indicates a cessation of growth, and excision need not be resorted to. A vascular head means active progression. The operation of removal is as follows: Grasp the neck of the pterygium with fixation forceps, making traction perpendicular to the surface; dissect up the head, and make two converging incisions into the body with a pair of scissors. The parts between these incisions are dissected away and the lozenge-shaped wound closed by a suture applied about the middle of the wound. Another method of removal is by *transplantation.* The growth is split longitudinally and is fixed in an upper and a lower conjunctival pocket with a suture. *Ligation* has also been recommended; a large part of the pterygium between the sclerocorneal margin and the base of the growth is strangulated by sutures in the manner shown in the illustration. It has been suggested that the whole trouble in pterygium lies in the apex, and curetting the affected cornea or the application of the galvanocautery has produced good results. Under the old operations pterygium was liable to occur, and sometimes repeated operations caused limitation of the ocular movements. Electrolysis is the most recent treatment proposed.

PTOMAIN.—A basic nitrogenous compound, resembling the alkaloids, and produced by the action of bacteria on organic matter. As they are usually formed in putrefactive processes, ptomains have also been termed *putrefactive alkaloids.* The name *cadaveric alkaloids* has also been given to them, but applies properly only to those obtained from the dead animal body. Some of the ptomains are poisonous; many are not. As a rule, each distinctive ptomain is produced by a different microorganism, but there are instances of several bacteria producing the same ptomain. The dependence of a ptomain upon microorganisms may be indirect and complicated by or dependent upon purely chemic changes. The kind of ptomain produced depends somewhat upon the stage of putrefaction, as ptomains are "transition products in the process of putrefaction." Their production is also influenced by the media in which the bacteria grow. A ptomain that is formed by a certain bacterium in one medium may not be produced by the same bacterium in another medium. Ptomains have been found in foods, as in mussels, oysters, eels, sausage, ham, canned meats, cheese, milk, ice cream, etc. The pathogenic action of certain bacteria may be due to their production of ptomains. In addition to the well-known ptomains, a number of unnamed substances have been studied that possess reactions and physiologic effects similar to or identical with those of well-known vegetable alkaloids. These at present can only be called after analogs —*e. g.*, **coniin-like substances**; others are called **atropin-like, delphinin-like, digitalin-like, morphin-like, nicotin-like, strychnin-like, veratrin-like,** etc. See Leukomain, Ptomain-poisoning.

PTOMAIN-POISONING.—Infection of the organism through the medium of the gastrointestinal tract.

Etiology. Exciting Causes.—Certain varieties of food which have partially undergone putrefaction, such as oysters, ice-cream (made of milk containing tyrotoxicon), sausage, meat, mussels, fish, and cheese. Sausage poisoning is not uncommon in Germany. Ham poisoning not due to trichina has been reported, and many cases of poisoning from canned meats are recorded, though these may be due to the chlorids of lead or tin. Milk, cheese, and ice-cream poisonings are not rare, although tyrotoxicon is not always the active cause. The mussel furnishes the most frequent source of poisoning from the shell-fish. See Ptomain.

These foods contain a variety of poisonous ptomains after decomposition, such as tyrotoxicon (in milk), neurin, mydatoxin, methyl-guanidin (in meats), mytilotoxin (in mussels), and a poisonous base in fish isomeric with ethylidene diamin $(C_2H_4(NH_2)_2)$.

Predisposing Causes.—(1) A catarrhal condition of the stomach and intestines; (2) dilatation of the stomach; (3) certain diseases, as typhoid fever, enteritis, peritonitis; (4) idiosyncrasy toward certain kinds of food.

Pathology.—In a case of ptomain-poisoning from milk observed by Vaughan and Prescott, the following lesions were found 15 hours after death: "The mucous membrane of stomach and intestines normal (bile-stained); the small intestine distended with gas; the jejunum ashy green in color; the ileum purplish green; the cecum, ascending, transverse, and descending colon empty; the circular fibers tightly constricted; the salivary glands distinct but not inflamed; Peyer's patches normal; the liver and spleen normal." Rigor mortis is usually quite marked.

In other cases of ptomain-poisoning the mucous membrane of the stomach and intestines has been found red and swollen, presenting the picture of acute inflammation; the large vessels filled with dark blood; the kidneys congested; spleen enlarged; the heart either empty or filled with dark blood.

It would seem, therefore, that the *materies morbi*, while primarily acting as a gastrointestinal irritant, after being absorbed spends its force chiefly upon the nervous system.

Symptoms and Clinical Course.—The symptoms of ptomain-poisoning usually manifest themselves in from 2 to 24 hours after the food has been taken.

Nervous Symptoms.—Sense of chilliness, coldness of extremities, headache, vertigo, dryness of mouth, extreme thirst, constriction of the throat, difficult deglutition, intense pains in the abdominal region and calves of legs, muscular weakness, twitching of eyelids and muscles of face, shoulders, and hands, tingling sensations, hallucinations, mental anxiety, imperfect vision, dilatation of pupils, strabismus, dyspnea, convulsions, and coma.

Gastrointestinal Symptoms.—Abdomen retracted, sense of heat in stomach, excessive nausea, persistent vomiting, usually watery diarrhea. Constipation is present in some instances.

Cutaneous Symptoms.—Scarlatinal rash, urticaria.

Circulatory Symptoms.—Heart feeble and quick, often 140 to a minute; violent throbbing of abdominal aorta.

Temperature.—In many cases there is a subnormal temperature (95° F.), but if the case is protracted, the temperature is somewhat elevated (100° to 102° F.).

Respirations are hurried (dyspnea), 35 to 40 a minute.

Diagnosis.—

Acute Gastrointestinal Autointoxication.	Cholera Morbus.	Mineral Poison.
1. Onset often from 2 to 24 hours.	1. Onset usually at night or early morning hours.	1. Onset within half an hour.
2. Results from eating animal (nitrogenous) food.	2. Results from eating fruits or vegetable food.	2. History negative
3. Nervous symptoms marked (twitching of facial muscles, tingling sensations, dilated pupils, convulsions).	3. Nervous phenomena, as seen in autointoxication, absent.	3. Nervous phenomena, as seen in autointoxication, absent.
4. Early dyspnea, cyanosis.	4. Respirations normal.	4. Dyspnea comes on late in mineral poisoning.
5. Temperature often subnormal.	5. Temperature often elevated a degree or two.	5. Temperature often elevated a degree or two.
6. Dryness of mouth and fauces, often bitter taste.	6. Bitter or sour taste in mouth.	6. Metallic taste in mouth.
7. Vomitus contains mucus, contents of stomach, or bile.	7. Vomitus has a sour or bitter taste without blood.	7. Vomitus variable, often tinged with blood, and containing trace of poison.
8. Generally watery diarrhea, sometimes constipation.	8. Diarrhea and tenesmus; feces greenish in color.	8. Feces may contain blood and trace of poison.
9. Various cutaneous eruptions (scarlatinal eruptions, urticaria).	9. Cutaneous eruptions absent.	9. Cutaneous eruptions absent.

Prognosis is guardedly favorable.

Treatment.—After the diagnosis has been fully determined, the first attempt should be directed toward the removal of the cause of the evil by aid of the stomach-tube, emetics (if needed), irrigation of the bowel with long rectal tube attached to a fountain syringe; and, subsequently, remedies to control the pain, to combat the symptoms of shock, and intestinal antiseptics to keep down intestinal putrefaction.

The stomach-tube may be introduced at once, and 1 1/2 pints of lukewarm water allowed to run in; the funnel of the tube should then be lowered and the fluid drained away. The process may be repeated until the stomach is thoroughly cleansed. See LAVAGE.

The rectal tube is then inserted into the bowel its full length and attached to a fountain syringe, and from 1 to 2 quarts of lukewarm water introduced. After the fluid has been expelled, the operation may again be repeated.

If emesis is not sufficient to expel the gastric contents and time is lost in procuring a stomach-tube, apomorphin (1/4 of a grain) may be given hypodermically. Should the bowels be constipated and the stomach retentive, magnesium sulphate (6 drams), Rochelle salt (6 drams), or solution of citrate of magnesia (10 ounces) may be given at once. Pain is best relieved by morphin (1/4 of a grain) hypodermically.

If collapse threatens, it must be combated with hypodermics of atropin (1/100 grain), strychnin (1/30 grain), nitroglycerin (1/75 grain), whisky, inhalations of ammonia, nitrite of amyl, and hot applications to abdomen and extremities. After the stomach and bowels have been thoroughly cleansed by means of irrigation and purgatives, the following prescription may be given:

℞. Codein,		gr. iij
Naphthalin, Bismuth subnitrate,	each,	ʒj.

Divide into 8 powders. One powder every 2 hours.

Naphthalin (10 grains) or naphthol (4 grains) may be given every 4 hours for 2 or 3 days. Salol (5 grains) may be substituted for the other intestinal antiseptics.

PTOSIS.—Drooping of the upper eyelid. It may result from any effusion or inflammation weighing down the upper lid. Excessive deposits of fat in the lid may cause it to droop. Ptosis also results from injury to or paralysis of the levator palpebræ muscle. It is one of the symptoms of palsy of the third nerve.

The treatment of ptosis consists in removing the cause if possible. In paralysis of the levator muscle strychnin and the galvanic current are useful. Several ingenious lid elevators have been devised for the relief of this condition. Operative interference has for its object the removal of a piece of the skin of the upper lid, or the insertion of silver wire to hold the lid up. The tendon of the levator muscle may be advanced, or the tarsus may be sutured to the temporal muscle. The patient can often relieve ptosis by learning to use the temporal muscle, or by throwing the head backward in order to see better.

A simple and effective operation for ptosis consists in passing a stout silk ligature vertically under the skin from the eyebrows to the margin of the lids, and firmly tying the ends. The noose formed in this manner is tightened every day, until it has cut its way through the confined tissues; the resultant cicatrix draws the lid to its normal position.

PTYALAGOGS.—See SIALAGOGS.

PTYALISM.—See MERCURY (Salivation).

PUBERTY.—1. The period at which the generative organs of the male or the female become capable of exercising the function of reproduction. 2. The changes in the generative organs and in the general system that accompany the inauguration of this period.

Puberty occurs earlier in warm climates, in sanguine temperaments, and in highly cultivated and luxurious states of society. It cannot be estimated by age alone, and it is modified by family or hereditary peculiarities and the influence of various diseases. In the male the voice becomes bass, while about the same time hair grows on the face, pubes, and other parts of the body. Before this the male genital organs develop; the testes enlarge, as do other parts of the sexual apparatus; seminal and other accessory fluids are secreted, and there is an out-burst of sexual feelings and instincts. The changes are so slowly proceeding that they are not completed until full age has been passed.

In the female the individual passes from childhood to womanhood. The external genital organs enlarge, the uterus, ovaries, and breasts develop, and the commencement of the periodic menstrual discharge is marked. This time is usually, in this climate, between 13 and 15 years. The nonappearance of menstruation may be due to some constitutional disease or some general condition, the rational treatment of which rather than any uteroovarian stimulation should receive the physician's attention. Many of the ailments common about the period of puberty are but forerunners and accompaniments of the functional and organic changes about to commence, especially in the female sex. The influence of excessive mental stimulation during puberty is a subject deserving attention. The mind should not be goaded or overstrained at this time. See ADOLESCENCE, ANATOMIC AGE.

PUERPERAL CONVULSIONS.—See ECLAMPSIA.

PUERPERAL FEVER.—Fever occurring in women during the first few days after childbirth. It is of two varieties—(1) **infectious** and (2) **noninfectious.**

Noninfectious puerperal fever may be due to a variety of causes. The most common are emotion, constipation, exposure to cold, and reflex irritation.

PUERPERAL INFECTION.—Infectious puerperal fever may be divided into—

A. That class in which the infecting agent—bacteria or ptomains—gains entrance to some part of the genital tract or its vicinity.

B. That class in which the infection enters the body at some point distant from the genital tract, as the infectious fevers, erysipelas, and malaria.

Class A.

Etiology.—The varieties of microorganisms capable of producing infection are the streptococci, which are the infecting agents in 80 to 95 percent of the cases; the staphylococci, the colon bacilli (see COLON BACILLUS INFECTION), the gonococci, and, in short, any of the germs capable of causing local inflammation or general disease. In addition to these the saprophytes of decomposition, by the manufacture of ptomains, play an important rôle in the commonest form of puerperal sepsis—sapremia. These germs gain entrance to the genital canal by the hands of the physician, nurse, or other attendant; by instruments used in or about the parturient tract; by the water used to wash and douche the patient; by the bed-clothing, personal clothing, vulvar pads, and material used to cleanse the vulva; and by the atmosphere, laden with dust or vitiated by bad hygienic conditions. Putrescible material contained within the genital tract, such as decidua, pieces of placenta, and blood-clots, forms a suitable area for their multiplication, growth, and dissemination. Finally, a certain small proportion of cases may be traced to autoinfection—*i. e.*, to the action of germs resident in the body and not introduced from without during or after labor. Such cases may arise from the rupture, during labor, of an old pyosalpinx or a suppurating cyst.

It should be remembered that while a large proportion of vaginal secretions contain pathogenic bacteria, these bacteria are frequently incapable of producing disease, since they are in a condition of diminished or absent virulence. It should also be remembered that the vagina possesses certain natural resisting powers against pathogenic invasion. These powers depend upon a special bacillus (Doederlein's) which, by the production of lactic acid, is antagonistic to pathogenic bacteria; the leukocytosis which is always present, due to chemotactic action; the anatomic structure of the mucous membrane of the vagina, resembling skin; the plug of cervical mucus; and the bloody discharge during the first few days of the puerperium.

Classification and Pathology.—The most convenient classification is that one which is dependent upon the part of the genital tract or its vicinity which is most extensively involved. Thus, we have the following:

1. **Endocolpitis, endometritis, and salpingitis**—inflammation of the mucous membrane of the vagina, uterus, and tubes. This is most frequently of the superficial or suppurative variety; it may, however, be ulcerative or phlegmonous.

2. **Metritis and cellulitis**—inflammation of the uterine walls and pelvic connective tissue. The former is the result of septic endometritis, the inflammation having extended beyond the mucous membrane and attacked the muscular wall. Cellulitis is usually the result of direct extension from the uterus; it not infrequently terminates in abscess formation.

3. **Peritonitis.**—This is the result, usually, of an extension through the tubes or a pelvic cellulitis. As a rule, the inflammatory process is limited to the pelvis; occasionally, diffuse peritonitis is seen.

4. **Uterine and Parauterine Phlebitis.**—This is caused by infection of blood-clots at the placental site. These may be disintegrated and swept into the circulation, producing pyemia. Rarely, phlebitis may occur from infection of the wall of the vein as it passes through a septic area.

5. **Sapremia.**—This is due to absorption of ptomains. The ptomains are generated by the putrefaction, in the uterus or vagina, of blood-clots, decidua, membranes, or placenta. It is the most common cause of fever after childbirth.

6. **Septic Cystitis, Ureteritis, and Pyelitis.**—This is frequently caused by infection from a dirty catheter. The condition becomes exceedingly grave when the kidney is involved. The inflammation may be suppurative or ulcerative in character.

7. **Septic Proctitis.**—This is a rare form of infection. It may be suppurative or ulcerative.

Symptoms.—The symptoms may be divided into local and general.

The local symptoms are: (1) Putrid discharge; this is not invariably present, but it is seen in the majority of instances. (2) Diphtheritic patches; these ulcerated areas about the cervix, vagina, and vulva are seen in the severer class of cases. (3) Edema of the vulva; usually present in more or less marked degree. (4) Localized pain and tenderness. (5) Abdominal distention. (6) Inflamed tubes and ovaries. (7) Subinvoluted uterus. (8) Pelvic exudates and, later, perhaps, signs of pelvic abscess.

The general symptoms are: (1) Rigors or chill, followed by rise of temperature. The temperature usually ranges between 101° and 104° F.; the chill is not infrequently absent. (2) Rapid pulse; this is an almost constant symptom. (3) Prostration, delirium, and usually constipation.

All of these symptoms are not to be expected in every case of septic infection. Rise of temperature and rapid pulse may be the only evidences of the condition.

Differential Diagnosis.—It is desirable to differentiate the various forms of sepsis. Unfortunately, this is not always possible; indeed, two or more of them not infrequently occur together. There are, however, certain distinctive signs which are of value:

1. **Endocolpitis, Endometritis, and Salpingitis.**—In the former speculum examination will reveal a red, swollen mucous membrane, and probably patches of ulceration about the vulva, vaginal vaults, and cervix.

2. **Metritis and Cellulitis.**—The uterus is large, boggy, and tender; the discharge is foul and copious; exudate may be felt through the vaginal vaults; the uterus is firmly adherent.

3. **Peritonitis.**—There is a very rapid, running pulse; the abdomen is greatly distended and very tender; constipation is a marked symptom.

4. **Phlebitis.**—The symptoms usually occur late in the puerperium; there is high and very irregular fever, with marked remissions, sometimes lasting 4 or 5 days; prostration is profound; phlegmasia alba dolens is commonly present; there are no severe local symptoms.

5. **Sapremia.**—This variety of sepsis should be expected if there are moderate fever, rapid pulse, and no other well-defined symptoms. A thorough disinfection of the birth canal will cause a rapid disappearance of these symptoms.

6. **Septic Cystitis, Ureteritis, and Pyelitis.**—There are pain and tenderness in the lumbar and hypogastric regions; urination is frequent and painful; blood and pus may be found in the urine.

7. **Septic Proctitis.**—There are pain in the rectum, diarrhea, and bloody stools; examination will reveal areas of ulceration on the mucous membrane of the bowel.

Treatment.—The treatment naturally divides itself into the (1) preventive and (2) curative.

1. **Preventive treatment** comprises care to avoid all sources of puerperal infection. It is considered under the management of labor. Careful attentions should be paid to the hygiene during pregnancy and to the sanitary condition of the lying-in chamber. Asepsis of patient, physician and accessories is imperative. No more internal examinations should be made than are absolutely necessary. See LABOR.

2. **Curative treatment** may be subdivided into constitutional, local, and special treatment.

Constitutional Treatment.—Give (1) calomel (1/2 grain) every hour until 4 grains have been taken. Follow this with Rochelle salt (1 dram) every half-hour until free catharsis is produced. (2) Milk (4 to 6 ounces) with lime water (1 fluidounce) and whisky (1/2 ounce) every 4 hours. Broths and beef-tea may be given during intervals if the patient can assimilate them. (3) Tincture of digitalis (10 drops) and sulphate of strychnin (1/20 grain) 4 times daily as long as the pulse is above 120 a minute. (4) Suppositories of quinin (5 grains) and pyrophosphate of iron (3 grains) twice daily. (5) Ergot is indicated to promote involution, thereby reducing the absorbent power of the uterus. (6) Inhalations of oxygen are of great value.

In addition to the foregoing, certain drugs that produce hyperleukocytosis, such as nuclein, may be tried. Nuclein, in some cases, has appeared to give very satisfactory results. Unguentum Credé, (a harmless remedy) may be used. Various results have been obtained from the intravenous infusion of formaldehyd solution. Pryor had excellent results with iodoform gauze packing subsequent to operation.

For reduction of the temperature hydrotherapy is valuable especially in the form of the wet pack or cold sponge. The ice-bag or coil applied intermittently is advocated for local tenderness.

The subcutaneous injection of a normal salt solution, a pint or more 2 or 3 times daily, has given good results. It probably acts by causing a hyperleukocytosis. Saline enteroclysis may be of service.

Serum Therapy.—Injections of antistreptococcic serum have given varied clinical results. If the steptococcus be present it may be used, but in conjunction with other treatment, as previously mentioned. The method of administration is as follows: 20 c.c. of reliable serum are injected deeply into the tissues as an initial dose. The daily dose in a desperate case should be 60 c.c. The serum may be tried as a last resort even in the absence of a microscopic examination of the lochia.

Local Treatment.—This consists in thorough disinfection of the parturient tract as follows: (1) Bring the patient in the lithotomy position across the bed, with the buttocks projecting well over the edge. (2) Sterilize vulva, vagina, instruments, and hands. (3) Seize the anterior lip of the cervix with a double tenaculum, and draw it well down to the vulva. (4) Curette thoroughly, using only the force of thumb and forefinger. (5) Remove any tabs of decidua or placenta digitally if possible —if not, by means of placental forceps. (6) Curette again carefully. (7) Irrigate with warm sterile water. (8) If the discharge has been very offensive, inject into the uterine cavity an emulsion of sweet oil (2 ounces) and iodoform (2 drams). (9) If the uterus does not contract firmly or if it is displaced, insert a light drain of iodoform gauze.

This constitutional and local treatment should be instituted in every case of puerperal sepsis. In addition it may be necessary to resort to the following:

Special Treatment. 1. Endocolpitis, Endometritis, and Salpingitis.—For the first two, repeated douches of sterile water or a 50 percent solution of alcohol should be given. If ulcerated areas of mucous membrane are present, they should be touched with nitrate of silver solution (1 dram to 1 ounce). In suppurative salpingitis laparotomy will be required.

2. **Metritis and Cellulitis.**—For the former, frequent intrauterine douches are required; in grave cases hysterectomy will be necessary. Cellulitis will yield in most cases to free purgation, counter-irritation, poultices, and douches; if abscess should occur, laparotomy must be performed and the abscess cavity evacuated and drained. If after the abdomen is opened it is found that the inflammation is confined to the pelvic connective tissue, the wound should be closed and the infected area opened and drained through the vaginal vault or above Poupart's ligament.

3. **Peritonitis.**—Salines, stupes, and free stimulation will be sufficient in mild cases. If active symptoms persist far beyond 48 hours, it is probable that suppuration has occurred. In such a case the abdomen should be opened, abscesses evacuated and drained, and diseased tubes and ovaries removed. It may also be necessary to perform hysterectomy.

4. **Phlebitis.**—Prolonged rest in bed, free stimulation, and an abundance of good nutritious food is required. If complications occur, such as septic pneumonia or arthritis or phlegmasia alba dolens, they must be appropriately treated. If one is certain that he has to deal with a pure phlebitis, local treatment is unnecessary or even harmful.

5. **Sapremia.**—Thorough disinfection of the parturient tract will cause a disappearance of symptoms in from 24 to 48 hours.

6. **Septic Cystitis, Ureteritis, and Pyelitis.**—Irrigate the bladder every 4 hours with boric acid solution (15 grains to 1 ounce). Use hot stupes, salines, and stimulation. Urotropin should be given. Abscess of the kidney may necessitate evacuation and drainage.

7. **Septic Proctitis.**—Irrigate the rectum with sterile water, and apply nitrate of silver solution (1 dram to 1 ounce) to ulcerated areas.

Class B.

The most common varieties of infectious puerperal fever, in which the infecting agent enters the body at some point distant from the genital tract, are malaria, typhoid, and erysipelas. To eliminate the first as the cause of fever, give blue mass (8 grains) followed by quinin (15 grains); next morning give a brisk saline purge and repeat the quinin.

PUERPERAL INSANITY.—This is a somewhat rare complication of childbirth, occurring once in about 400 cases. It commonly manifests itself as mania, melancholia, or dementia—the former being the most frequent. It usually makes its appearance during or just after labor, less frequently during lactation, and rarely during pregnancy.

Causes.—The reduction in physical and mental power caused by the strain of gestation might be considered the predisposing cause. Exciting causes are profound emotion, dystocia, anemia, albuminuria, and septicemia.

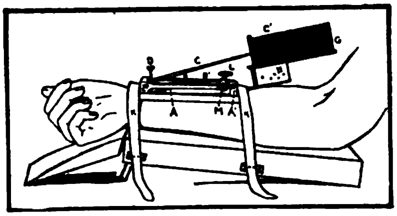
Diagnosis.—The diagnosis is not difficult, although it is important to distinguish it from the temporary delirium of labor, the delirium of fever, and delirium tremens.

Prognosis.—With appropriate treatment about 66 2/3 percent recover their reason in the course of a few months. Of the remainder, a small proportion die from infection or exhaustion, and the rest remain permanently insane.

Treatment.—This consists in the administration of tonics and nutritious food; a change of scene, open-air exercise, and general hygienic precautions are most beneficial. The patient must be constantly watched, lest she attempt some injury to herself or child.

PULSE.—Much information of the action of the heart, of the blood, and of the artery itself may be gained by a simple examination of the radial pulse.

The physicians in olden times gave much careful attention to the pulse, and the amount of information to be gained from its study is astounding. By the introduction of percussion by Auenbrugger in 1761, and auscultation by Laennec in 1816, the interest in the study of the pulse was decidedly lessened. This interest was further diminished by the introduction in 1861, by Marey, of the **sphygmograph,** an instrument for recording graphically the differential features of pulse in health and disease. The clinical thermometer, introduced somewhat later, dealt a deathblow to the painstaking study of the pulse.



Marey's Sphygmograph.—(*Greene.*)

A. Steel spring. *B*. First lever. *C*. Writing lever. *C'* Its free writing end. *D*. Screw for bringing *B* in contact with *C*. *G*. Slide with smoked paper. *H*. Clockwork. *L*. Screw for increasing the pressure. *M*. Dial, indicating the pressure. *K*, *K*. Straps for fixing the instrument to the arm and the arm to the double inclined plane or support.

To take the pulse, the physician should be seated by the side of the patient, who should be in a sitting or recumbent posture, with arm extended and resting on some support. The physician should lightly place the 4 fingers of his right hand over the left radial artery of the patient, with his index-finger nearest patient's hand; the little finger will thus be the first to receive the stroke. The pulse should always be taken at each wrist, for reasons to be given later. By so doing the presence of aneurysms may often be suspected and frequently verified. Pressure should be made and relaxed alternately. Points to be noticed are: (1) The size of the artery; (2) pulse rate or frequency; (3) regularity of rhythm; (4) uniformity of strength; (5) synchronism and equality of the right and left radial pulses; (6) the force required to obliterate them (tension); (7) abnormal thickening of the artery (arteriosclerosis). A strong pulse is characterized by volume and vigor; a weak one by the reverse conditions. The number of pulsations to the minute, which can generally be counted accurately by means of a watch, is the least important of all the points to the experienced clinician, who cares little whether the heart contracts 75 or 100 times a minute. He is mainly "interested in the dynamics of the viscus rather than in the derangement of its running-gear." Above all things should the family physician be familiar with the pulses of his patients in health, for, as is well known, some families have abnormally slow and others fast pulses.

The pulse may be modified (1) as to frequency, (2) rhythm, (3) volume, (4) tension.

Frequency.—The normal pulse-rate in the male adult may be said to be 76 a minute and 80 for the female; at birth it has been placed at 120 to 130, and 100 at the second year.

The frequency of the normal pulse may be increased by excitement—such as fright—emotion, by violent exercise, and by the use of drugs, such as stimulants. An increased frequency of the pulse is spoken of as **tachycardia,** (*q. v.*). It is often greatly increased (1) in fevers, as scarlet fever, and diphtheria; (2) shock from loss of blood; (3) exophthalmic goiter; (4) pressure on the base of the brain; (5) organic heart-disease, angina pectoris, etc.

Bradycardia, (*q. v.*), or a **slow pulse,** is seen in (1) jaundice; (2) atheroma; (3) lesions of the cerebral centers; (4) fatty degeneration; (5) often after the use of such drugs as aconite, digitalis, and opium; (6) Stokes-Adams syndrome. A slow pulse is often a physiologic plenomenon.

Rhythm.—Often the interval between the beats is disturbed, and there will be (1) an intermittent pulse or (2) an irregular pulse (arrhythmia).

Intermittent pulse is often seen in those who habitually use tobacco, or after hearty eating. It is commonly due to reflex causes, as constipation and diseases of the stomach, liver, or kidneys. The rheumatic or lithemic diathesis may give rise to a slow pulse.

Irregular pulse is often found in disease of the heart-muscle or in disease of its valves. It is very common in mitral regurgitation.

Dicrotic pulse is a condition of the pulse in which the first impulse as it strikes the finger is quickly followed by another impulse or a secondary wave. It is found often in conditions of marked exhaustion or toxemia as in typhoid fever, and in other febrile diseases.

Quick pulse (*pulsus celer*) or **water-hammer pulse** (*Corrigan's*) is a condition of the pulse characterized by a short, sharp, strong impulse, which seems to collapse under the finger. It is best detected by holding the arm erect. It is almost diagnostic of aortic regurgitation under certain conditions. It also occurs in anemia and fevers when the arterioles are relaxed.

Pulsus paradoxus is a pulse in which the wave is small and imperceptible during full inspiration. It is seen sometimes in health and often in adherent pericardium.

Volume.—When the beat of the pulse is large or strong, it is known as a **full pulse,** such as is found in plethora or in the robust. If the beat is weak, it is known as a **small pulse,** such as is found in debility or exhaustion.

Strength.—A **strong pulse** is one in which there are little compressibility and a strong impulse, such as is found in hypertrophy of the heart. Its opposite is a **weak pulse,** as in adynamic states.

Tension or Resistance.—It may be either hard or soft. A **hard pulse** is one of high tension, or one in which there is great contractile power; it is often seen in hypertrophy of the left ventricle, interstitial nephritis, septicemia, angina pectoris, arteriosclerosis; certain intoxications like gout, lead poisoning, diabetes in elderly persons. It is observed in apoplexy and at times in anemia. A small, hard, **wiry pulse** is noted in the early stage of peritonitis. A **soft pulse** is of low tension and easily compressible, indicative of a loss of tone in the arterial coats. It is found in low fevers, such as typhoid, the later stages of pneumonia, and in adynamic conditions in general. It is sometimes hereditary and may be observed in obesity. See HEART-DISEASE (Functional).

PULVIS.—See POWDER.

PUMPKIN SEED.—See PEPO.

PUPIL, CHANGES IN MOTILITY.—**Mydriasis,** or extreme dilatation of the pupil, occurs under the effects of drugs possessing a mydriatic action, such as atropin, homatropin, hyoscyamin, etc.; in glaucoma; in optic nerve atrophy; in diseases of the orbit; after fright; in neurasthenia; after irritation of the cervical sympathetic, as by an aneurysmal tumor; and sometimes in idiots. Permanent mydriasis has occurred after the instillations of a mydriatic have been suspended. Mydriasis of distinctly cerebral origin is caused either by irritation due to some lesion in the brain or cervical portion of the spinal cord, or by paralysis of the oculomotor center due to hemorrhage, thrombosis, tumor, or abscess of the brain.

The **treatment** of mydriasis consists in remedying the cause, if possible; locally, pilocarpin or eserin is indicated, and the galvanic current is sometimes of use. Exercise of the eyes with convex lenses upon near objects may be of value.

Miosis, or permanent contraction of the pupil, occurs under drugs possessing miotic action, such as eserin, pilocarpin, etc.; in paralysis of the cervical portion of the spinal cord, particularly in locomotor ataxia; in paretic dementia; in cerebral syphilis; and in bulbar palsy, with progressive muscular atrophy. Persons who continually use their eyes on fine objects, such as watchmakers and engravers, sometimes suffer from miosis. In opium-poisoning the pupil is reduced to the size of a pinpoint, dilating just before death. Nicotin and alcohol in poisonous quantities may produce miosis. As contraction of the pupil may result from irritating cerebral lesions similar to those causing dilatation, it is important to have some means of differential diagnosis. Berthold mentions that miosis occurs in a sudden attack of paralysis due to embolism, and mydriasis in an attack due to ophthalmia. Idiopathic cases are said to result from syphilis, tuberculosis, rheumatism, and other systemic disorders.

Treatment is virtually the same as that for iritis, although atropin must be used with caution, as it is often very poorly borne. Plastic and purulent cyclitis must be treated rigorously with mercurial inunctions. For the reduction of tension, the local use of eserin, diaphoretics, and paracentesis are indicated. In purulent cyclitis, especially after operations, antiseptic douches are indicated. On account of the uncertain prognosis, the possibility of relapses, disorganization of the vitreous, and sympathetic ophthalmia, the patient must be carefully watched, and expectant treatment continued after the symptoms have subsided.

Anisocoria, or **inequality in size of the pupils,** may occur in perfect health. In fact, it is much more common than text-books indicate. It is sometimes seen in eyes of widely dissimilar refraction, diseases of the brain and nervous systems, and in insanity. It is not uncommon in tabes, disseminated sclerosis, and paretic dementia.

Wernicke's sign, or **hemiopic pupillary inaction,** is mentioned in the discussion of HEMIANOPSIA (*q. v.*). Light is carefully thrown on the blind side of the retina; if there is reflex contraction, the lesion is behind the pupillary centers; if there is no reflex obtained, the lesion is at or in front of the pupillary centers.

The **Argyll Robertson pupil** is a name given to a reflex pupillary rigidity producing loss of reaction to light stimulation, although the action to accommodation and convergence may still be present. It is a diagnostic sign of value in locomotor ataxia, but has been noticed in general paralysis of the insane, in cerebral syphilis, and is the result of poisoning by bisulphid of carbon

The orbicularis pupillary reaction refers to contraction of the pupil when a forcible effort is made to close the lids.

Hippus is the name given to the oscillatinos occurring after contraction to light. It is exaggerated in hysteria, disseminated sclerosis, epilepsy, and in the early stages of acute meningitis.

Iridodonesis is a tremulous condition of the iris, due to lack of a normal support of the lens. It is seen in conditions in which the lens is dislocated posteriorly, in atrophy of the vitreous, in overripe cataract, and after cataract extraction.

PURGATIVES.—See CATHARTICS.

PURPURA (Peliosis Rheumatica).—A hemorrhagic disease characterized by the appearance on the skin of variously sized and shaped reddish-purple macules, not disappearing under pressure.

Varieties.—There are 3 chief varieties, distinguished by the premonitory and concomitant constitutional symptoms, by the extent of hemorrhagic extravasation, and by the cause: (1) Purpura simplex; (2) purpura rheumatica; (3) purpura hæmorrhagica.

Purpura Simplex.

The eruption usually appears suddenly and consists of pinhead-sized to bean-sized, round, oval, irregular, claret-red or purplish spots. They are circumscribed, smooth, and nonelevated, and are symmetrically distributed, tending particularly to occur upon the lower extremities. Subjective symptoms are, as a rule, absent. There is commonly no systemic disturbance, and the disease tends to a favorable termination in the course of a few weeks.

Purpura Rheumatica (Peliosis Rheumatica). This form is ushered in with fever, lassitude, anorexia, and severe rheumatoid pains, particularly in the lower extremities, the joints of which may be swollen. The eruption consists of well-defined, splitpea-sized to finger-nail-sized hemorrhagic patches which may be slightly elevated or level with the skin. At first of a pinkish, reddish, or purplish color, they later pass through the color transitions of all ecchymoses. The eruption is more or less generalized, but is most marked upon the extremities. The disease may last a few weeks or persist, in the form of relapses, for several months. It is sometimes associated with erythema multiforme.

Purpura Hæmorrhagica (Morbus Maculosus Werlhofii; Land Scurvy).

The onset of the hemorrhagic form is signalized by the occurrence of fever and symptoms of systemic depression. The eruption consists of hemorrhagic patches varying in size from that of a small coin to that of the palm of the hand, which come out suddenly and in considerable numbers. The trunk and extremities are the regions usually involved. At the same time, bleeding from the mouth, gums, nostrils, bowels, bladder, etc., may take place. The disease may terminate in a fortnight or may continue for weeks. In a certain number of cases it proves fatal.

Etiology.—The causes of purpura are obscure. The disease, especially the hemorrhagic type, occurs more often in debilitated individuals. Some look upon the vasomotor apparatus as the agency primarily at fault; others believe purpura to be an infectious disease. Such drugs as arsenic, potassium iodid, chloral, quinin, and the salicylates may produce hemorrhagic eruptions.

Pathology.—As a result of an alteration in the blood or blood-vessel walls an extravasation of blood takes place into the tissues. After a variable period of time this undergoes resorption, the changes in the blood pigment producing the varying colorations. The process is not attended with inflammation.

Diagnosis.—The evident hemorrhagic nature of the lesions and their failure to disappear upon pressure distinguish them as purpuric. Purpura hæmorrhagica may be confounded with scorbutus:

SCORBUTUS.	PURPURA HÆMORRHAGICA.
1. Occurs in those subject to lack of vegetable food and to bad hygiene.	1. No such etiologic relationship.
2. Definite premonitory symptoms: weakness, impaired circulation, etc.	2. Premonitory signs slight or absent.
3. Onset slow.	3. Onset sudden.
4. Gums spongy, swollen, and bleeding; teeth loose.	4. Gums often bleeding but not swollen.
5. Severe muscular pains.	5. Less marked.
6. Brawny infiltration of lower extremities.	6. Not present.
7. Hemorrhages from mucous membranes not, as a rule, profuse.	7. Hemorrhages from mucous membranes often so severe as to prove fatal.

Prognosis.—In purpura simplex and rheumatica the prognosis is favorable, recovery taking place in several weeks or months. In purpura hæmorrhagica the prognosis is more guarded, a certain number of cases succumbing to internal hemorrhage.

Treatment.—The treatment of purpura must be adapted to the exigencies of the individual case. Ergot, tincture of the chlorid of iron, quinin, turpentine, and the mineral acids are useful in all forms of the disease. In purpura rheumatica and hæmorrhagica the patient should be confined to his bed and placed upon a nutritious and easily assimilable diet. Locally, astringent lotions and ice, if necessary, may be employed.

PUS.—See SUPPURATION.

PUSTULANT.—See COUNTERIRRITATION.

PYELITIS (Pyelonephritis).—Inflammation of the mucous membrane of the pelvis of the kidney. Except in the mildest cases, the kidney proper becomes simultaneously involved. To the former condition the term pyelitis is applied; to the latter, pyelonephritis.

Etiology.—(1) Renal calculus; (2) secondary to urethritis or cystitis; (3) tuberculosis; (4) after infectious diseases, such as typhoid fever, scarlet fever, diphtheria, small-pox; (5) carcinoma.

Microorganisms may gain access to the kidney either through the blood stream or through the urinary tract. When infection occurs in the former way it is called hematogenous; when in the latter, urogenous. See COLON BACILLUS INFECTION.

Pathology.—The mucous membrane of the pelvis of the kidney is swollen, turbid, and often shows minute extravasations. The epithelium has in certain areas undergone degeneration, forming mucus or pus. The suppurative process may finally extend into the kidney structure, giving rise to pyelonephritis, and a large abscess may occupy the entire area of the kidney. In certain instances the fluid material may be entirely absorbed, leaving a putty-like material.

Symptoms and Clinical Course.—There is pain in the lumbar region and also anteriorly, detected on deep pressure. The fever is irregular, occasionally accompanied by hectic symptoms, with sweat and chill. In some cases the disease may simulate typhoid fever. The urine is clear at times, but generally has a turbid color, with a heavy precipitate containing a large amount of mucus, pus-cells, red blood-corpuscles, and pelvic epithelium. Blood-clots may be passed.

The purulent material renders the urine albuminous.

Diagnosis.—

PYELITIS.	NEPHRITIS.	CYSTITIS.
1. History of case.	1. Increased micturition; sweat and chills rare.	1. Micturition accompanied by tenesmus; often burning pain.
2. No tube casts.	2. Albumin and various kinds of casts.	2. No tube casts.
3. Pus in urine.	3. Pus rare.	3. Blood often at end of micturition.
4. Dropsy rare.	4. Dropsy common.	4. No dropsy.
	5. Urea diminished.	

Prognosis.—The prognosis is variable; simple pyelitis may exist for years without the substance of the kidney itself becoming involved. Pyelonephritis, as a rule, gradually leads to destruction of the kidney and therefore must be considered a serious disease.

Treatment.—The treatment of acute pyelitis consists in the employment of antiphlogistic measures and the administration of narcotics and urinary antiseptics. Of the latter urotropin is the most valuable. Regular evacuation of the bowels should be secured. If threatening symptoms persist, such as high fever and chills, and if an exact diagnosis can be made as to which kidney is diseased, or at least as to which one is the more diseased a brilliant curative effect can sometimes be secured by splitting the kidney. This applies to pyelitis as well as pyelonephritis, but is only of value in the ascending forms of the disease.

In chronic pyelitis, and pyelonephritis, the use of urinary antiseptics and the employment of hygienic measures are also indicated. For pyelitis due to infection with the gonococcus or colon bacillus Casper recommends irrigation of the renal pelvis with a solution of silver nitrate 1 : 1000. In chronic pyelonephritis nephrotomy often brings about a cure. See KIDNEY (Injuries, Surgery), NEPHRITIS.

PYEMIA.—Phlebitic septicemia, with the presence of pyogenic microorganisms in the blood and with the formation, wherever they lodge, of secondary embolic or metastatic abscesses. It is characterized by intermittent fever, with recurrent rigors, profuse sweats, a sweetish odor to the breath, a dry, brown tongue, and rapid emaciation. Slight jaundice frequently develops; sometimes, also, a purpuric eruption; the temperature may be very high—105° F., or even more. It usually terminates in death. See SEPSIS.

PYLORUS.—See STOMACH.

PYOKTANIN.—See METHYL-VIOLET.

PYOMETRA.—See HEMATOMETRA.

PYONEPHROSIS.—Pyonephrosis is the distention of the pelvis and calices of the kidney with pus, and the subsequent destruction, more or less complete, of the medullary and cortical substance, the whole kidney being at length converted into a large multilocular suppurating cyst. This cyst may rupture into the peritoneal cavity or colon, or into the surrounding tissue, causing a perinephritic abscess.

Etiology.—Infective nephritis with retention of pus is a very common cause, but some cases of pyonephrosis are due to infection of a hydronephrosis.

Symptoms.—In addition to a tumor in the abdomen with characters similar to those of hydronephrosis, there will be pain in the tumor, especially on pressure, and if the obstruction of the ureter is incomplete, pus in the urine, septic fever varying with the absorption.

Treatment.—Nephrotomy, with removal of any obstruction discovered in the pelvis of the kidney or ureter. If after nephrotomy, however, the cyst does not shrink and cease to suppurate, and the opposite kidney is sound and working well enough, nephrectomy may have to be done, as otherwise lardaceous disease may carry off the patient, or blood-poisoning may ensue from the discharge becoming septic, or, as sometimes happens when the obstruction of the ureter is relieved to some extent by the nephrotomy, the decomposing pus may make its way into the bladder, set up cystitis, and the other kidney become affected. When the disease is bilateral both kidneys are drained through the loins. See PYELITIS.

PYORRHEA ALVEOLARIS.—**Rigg's Disease, Phagedenic Pericementitis** (Black), **Interstitial Gingivitis** (Talbot), **Phagedenic Pericemental Alveolitis** (Logan).

Definition.—A chronic destructive disease of the supporting structures of the human tooth.

Etiology.—The usual *systemic predisposing* causes are diseases of the heart and vessels, diabetes and Bright's disease. Chronic rheumatism and digestive disturbances are held to be the most serious predisposing factors. *Local predisposing causes:* Lack of maintenance of proper hygiene; absence of normal contacts and masticatory influences; excessive irregularities and malocclusion of the teeth. *Local exciting causes:* Presence upon the crown and root surfaces of teeth of inorganic and organic deposits of a fatty glue-like substance impregnated with pyogenic bacteria; lodgment of food in the interproximal spaces; the presence of pyogenic organisms that chronically involve the pericemental alveolar structures which normally support the teeth.

Diagnosis.—This disease exists whenever serumal deposits are found upon the exposed cementum, and a septic chronic destructive inflammation coexists in the pericemental and alveolar structures, providing this exposed cementum resulted from some disturbance that had its origin of irritation in the gums. This disease exists also when we find a chronic septic destructive process beginning at the gums and progressively involving the pericemental and alveolar tissues in such a manner as to create well defined pockets in the form of narrow routes at the expense of the pericemental tissues and the inner surface of the alveolar structures some distance in advance of the alveolar rim involvement. According to the above diagnostic findings phagedenic pericemental alveolitis exists without serumal deposits being found in the pockets as well as with them. However, in over 90 percent of the advanced cases serumal deposits are present.

Subjective Symptoms.—Patients as a rule not aware of the presence of the disease until it has progressed to a serious stage; then low, dull, gnawing pains are experienced in the part for a few days at a time, with variable periods of rest from discomfort. In advanced cases tenderness is felt when masticating food.

Objective Symptoms.—Deep dark red discoloration of the gums and adjacent soft tissues overlying the bone structures about the roots involved. Excessive hemorrhage from gums from the slight irritations caused by thorough examination, the usual brushing, and the mastication of food. Sufficiently pronounced hemorrhage occurs sometimes during sleep to saturate the pillow. In advanced cases pus can be forced up around the necks of the teeth involved from practically all of the pockets found. The teeth eventually become abnormally mobile and permanently shift from their normal positions causing characteristic deformities. The roots gradually become exposed as the supporting structures are progressively destroyed.

Treatment, operative, consists in the removal of all deposits found upon the exposed cementum in the pockets. Smooth the roughened cementum with sharp instruments and polish with pumice and orangewood point all exposed tooth surfaces. **Surgical,** remove all degenerating pericemental fibers from the tissues forming the borders of the pockets, carefully examining remaining alveolar process and if carious areas are found, these areas are to be curetted. **Medicinal,** irrigate pockets during operative and surgical treatment with a physiological salt solution, which is to be made fresh for every patient. Senn's solution should be employed for the final medicinal treatment in the pocket. Tincture of iodin for local application to be applied upon the gums and overlying structures is sometimes beneficial in causing the acute inflammation to subside. The constant use of astringent mouth washes acts against rather than in favor of gaining and maintaining control of this disease. Tooth powders and mouth washes or the application of counterirritants will not even temporarily control this disease and therefore should never be relied upon. However, the use is commended to aid in maintaining the proper oral and dental cleanliness necessary for the prevention of the beginnings of excessive dental caries and diseased conditions of the gums and supporting structures of the teeth.

Prosthetic Treatment.—A reestablishment of all lost contacts and the fixation of the abnormally loose teeth is to be brought about by the constructing of metal splints that are to be cemented into place.

Prognosis for *single rooted teeth* when only the gingival third is involved, is good; when the middle third is extensively involved prognosis is only fair; when the apical third is extensively involved the tooth should be immediately extracted. **Prognosis** of *multiple rooted teeth* when gingival third is involved is good; but when middle third is extensively involved the tooth should be extracted or one of the roots excised.

PYOSALPINX.—See Fallopian Tubes.

PYOTHORAX.—See Pleurisy (Purulent).

PYRAMIDON.—A derivative of antipyrin in which an H-atom of the pyrazolon group is replaced by a dimethylamido group. It forms a yellowish-white, tasteless, crystalline powder, soluble in water (1 : 10). This solution gives a violet fugitive color with Fe_2Cl_6. Nitrous acid gives an evanescent violet. In the urine pyramidon is best detected by the ferric chlorid test. The action of pyramidon upon the nervous system is analogous to that of antipyrin, but it is active in much smaller doses. It is much milder, more gradual and lasting in its influence than antipyrin. Dose, 2 to 8 grains. For consumptives and in hectic fever the minimum dose should not be exceeded. *P. Acid Camphorate* and *P. Neutral Camphorate.* The acid and neutral salts combine the antipyretic action of pyramidon with the antihidrotic action of camphoric acid, the former action predominating in the neutral salt, the latter in the acid salt. It is said that the tonicity of pyramidon is thereby reduced, while the camphoric acid has greater antihidrotic power. They are especially efficacious in the night-sweats of phthisis. Dose of the neutral salt, 8 to 12 grains; of the acid salt, 12 to 15 grains.

P. Salicylate is antipyretic, analgesic and antiseptic, combining the activity of its components, pyramidon and salicylic acid. It is recommended in rheumatic and gouty affections, neuralgia, pleuritis, etc. Dose, 8 to 12 grains.

PYRETHRUM (Pellitory).—The root of *Anacyclus pyrethrum.* It contains an alkaloid *pyrethrin,* also inulin, tannin, mucilage, etc., with a brown *resin* and two fixed oils. When taken into the mouth, it increases the flow of saliva, and is used as a masticatory in dry conditions of the mouth, in relaxed states of the throat, and in aphonia; also in headache and facial neuralgia. It is valuable mainly as a masticatory and sialagog. Dose, 10 to 45 grains. **P., Tinct.,** 20 percent; used externally. *P. roseum,* Persian pellitory. The powdered flower-heads are used as an insecticide.

PYROGALLOL. $C_6H_3(OH)_3$.—A triatomic phenol obtained chiefly by dry distillation of gallic acid, occurring in light, white, shining laminæ or fine needles; of bitter taste, but soluble in water, alcohol, and ether. Dose, 1 to 2 grains. It is a powerful reducing agent, and is used as a disinfectant in 1 to 2.5 percent solutions. As an ointment (1 dram to 1 ounce) it ranks next to chrysarobin, for use in psoriasis, while in lupus and epithelioma it is supposed to attack only the diseased nodules, leaving uninjured the adjacent skin. By the mouth, for internal hemorrhage, it has been used in 20-grain doses. Large doses may produce hemoglobinuria and general disorganization of the blood-corpuscles.

PYROPLASMOSIS HOMINIS.—A peculiar fatal disease of certain parts of Idaho, Wyoming, Montana, Nevada, occurring during the spring and early summer, apparently only in persons who have been bitten by ticks. Certain observers believe it to be due to the *pyroplasma hominis*, which is closely related to the pyrosoma bigeminum, the cause of Texas cattle fever, and is believed to be transmitted by means of the bite of a tick (though the latter may be overlooked by reason of its presence at times only in the hair above the genitals). This organism is found in the patient's blood.

Symptoms.—After an incubation period of from 3 to 10 days, headache, nausea, muscular soreness, and a chill or chilliness and nose-bleed are followed by a rapidly rising fever and unduly rapid pulse and respiration. On the third day a rash, macular, bright red, in severe cases petechial, appears first on the forehead and extremities, later on the chest, abdomen, and back. It is profuse except on the abdomen. Desquamation may follow. Albumin is present in the urine. In fatal cases rapid anemia appears with sustained high temperature and rapid weak pulse. About the twelfth day the temperature falls by lysis in favorable cases, but 70 to 90 percent terminate fatally.

Prophylaxis.—It is wise not to live in these districts during the spring and early summer. Tick bites should be guarded against, but if incurred, ammonia, kerosene or turpentine should be applied, followed by cauterization with pure phenol.

Treatment is stimulating and symptomatic.

PYROSIS (Heartburn).—An affection of the stomach characterized by a burning sensation, accompanied by eructations of an acrid, irritating fluid. See GASTRIC NEUROSES, GASTRITIS.

PYROXYLIN (Soluble Gun-cotton).—Chiefly tetranitrate of cellulose, used for preparing collodions. Collodion rapidly dries on exposure to air by evaporation of its ether and leaves a transparent film of pyroxylin on the surface to which it has been applied. This film, if the flexible collodion be used, will not contract or crack on drying.

PYURIA. — See CYSTITIS, PYELITIS, URINE (Examination).

Q

QUARANTINE.—The time (formerly 40 days) during which a vessel from ports infected with contagious or epidemic diseases is required by law to remain outside the port of its destination, as a safeguard against the spreading of such disease. The necessity and means of quarantine in infectious diseases are discussed under the separate headings of the different diseases. The methods of disinfection are considered under the heading DISINFECTION (*q. v.*).

QUASSIA.—The wood of *Picrasma excelsa*, or of *Quassia amara;* the former is known commercially as Jamaica quassia, and the latter as Surinam quassia. The wood is turned into cups, which are sold under the name of quassia- or bitter-cups. It contains a bitter principle, *Quassin*, $C_{31}H_{42}O_9$, which is crystalline, soluble in hot alcohol and in chloroform, slowly in cold water, faster in alkaline or acidulated water. Dose of the powdered wood, 5 to 15 grains. Quassia is fatal to flies and fish, and makes an excellent anthelmintic enema against the thread worm. The lower bowel should be washed out with soap and water, and from 1/2 to 1 pint of an infusion, made by adding 1 or 2 ounces of quassia chips to a pint of water, should be injected and retained for some minutes. Several such injections will invariably kill seat-worms or thread-worms, but enough fluid should be injected to reach high up in the rectum, and the washing with soap and water should not be omitted. Quassia contains no tannin, and may be prescribed with salts of iron. In atonic dyspepsia, with pain after eating and regurgitation of food, and to promote appetite and digestion, it is much employed.

A bitter tonic:

℞.	Extract of nux vomica,	gr. iv
	Extract of quassia,	gr. xx
	Sulphate of quinin,	gr. xl.

Make into 20 pills. One pill 3 times daily after meals.

Preparations.—**Q.-cup,** a cup made of quassia wood, called also *bitter-cup*, from which water may be drunk, the bitter principles becoming dissolved in the water. **Q., Ext.,** its properties are due to a bitter principle, *quassin.* Dose, 1 to 3 grains. **Q. Fluidextract.** Dose, 5 to 15 minims. **Q., Infus.,** quassia chips, 1 dram; water, 10 ounces. Dose, 1 to 3 ounces. **Q., Tinct.,** 20 percent in strength. Dose, 5 minims to 1 dram.

QUEEN'S-ROOT.—See STILLINGIA.

QUERCUS (White Oak).—The bark of the white oak tree. It is astringent and tonic, but seldom used internally, its action being that of tannic acid. A decoction or infusion is much used as a cheap astringent application in leukorrhea, vaginitis, gonorrhea, prolapsus ani, hemorrhoids, etc., and as a gargle in faucial inflammations and for prolapsed uvula. It stains the clothing very slightly. *Q. tinctoria* stains the clothing very badly, but it is equally efficient. As an astringent poultice, the powdered bark is used to check discharges of freely running sores. An infusion of 1 ounce to a pint of water is of sufficient strength. **Q. Fluidextract.** Dose, 5 to 20 minims.

QUICKENING.—The first sensation of the movements of the fetus in a pregnant woman. It usually occurs at about the twentieth week. Some women experience it earlier than this, and in some it appears to be entirely absent. It has been likened in character to the fluttering of a bird held in the partly closed hand. It is one of the important subjective signs of pregnancy. See PREGNANCY (Diagnosis).

QUICKSILVER.—See MERCURY.

QUILLAJA (Soap Bark).—The inner bark of *Quillaia saponaria.* Its properties are due to a glucosid, *saponin.* It is a sternutatory, irritant to the mucous membranes, and an expectorant having an agreeable taste. Dose of a 5 : 200 decoction, 1 to 2 drams, according to age.

QUINIDIN.—A cinchona alkaloid, isomeric with quinin, with which it corresponds in therapeutic effects; but it is thought to produce less unpleasant symptoms in the head. **Q. Sulph.,** readily soluble in acidulated water and alcohol; it is an excellent antipyretic and antiperiodic. Dose, 20 to 60 grains or more. **Q. Tannate,** used in diarrhea, nephritis, and malaria. Dose, 2 to 12 grains twice daily.

QUININ.—Quinin is a finely crystalline or amorphous white alkaloid obtained from various species of CINCHONA (*q. v.*). It is odorless, very bitter, alkaline in reaction, and soluble in 1600 parts of cold water or 0.6 parts of alcohol. It is a valuable tonic, antiseptic, antipyretic, and antiperiodic. Quinin and its salts are distinguished from all other alkaloids, excepting quinidin and quinicin, by the emerald-green color given to their solution by chlorin water followed by ammonia.

Therapeutics.—Quinin finds its principal field of action in the malarial diseases, over which its influence is specific, by reason of its power to prevent the development of the plasmodium to which malaria is due. In intermittent fevers a 10-grain dose of the sulphate should be given in the sweating stage, and again 5 hours before the expected time of the next paroxysm. In the intervals arsenic is better used, as quinin may cause a daily exacerbation of temperature if long continued. In remittent fevers 20- to 30-grain doses should be administered once or twice a day until the temperature is reduced to the normal point. In pernicious remittent fevers large doses (30 to 40 grains) are necessary to the safety of the patient.

In chronic malarial poisoning quinin has considerable power, but chinoidin is more effective. Quinin (5 to 10 grains daily) is efficient as a prophylactic against malaria. See MALARIAL FEVERS.

As an antipyretic, quinin is used with the best results, especially in septic fevers, typhus, typhoid, variola, pneumonia, and acute rheumatism. Inflammations may, at their inception, be aborted by 15- or 20-grain doses, combined with morphin, which in this respect is synergistic to quinin. Acute tonsillitis and acute catarrh may sometimes be aborted by a full dose. In surgical fevers, pyemia, and exhausting suppurative conditions, also in septicemia, hectic fever, and before surgical operations, quinin is much employed. Neuralgias of malarial origin are amenable to it, as also neuralgia of the ophthalmic division of the fifth nerve. In eruptive fevers—especially scarlet fever, erysipelas, and measles—it is advantageously administered throughout their course. In some skin-diseases—particularly erythema nodosum—it is quite efficient, also in whooping-cough and hay-fever. In the latter affection a solution of 6 grains to the ounce of the neutral hydrochlorid is a very useful local application. Of internal antipyretics, the safest and best is quinin, next in order being phenacetin.

Warburg's tincture has obtained a very high reputation in the hands of Indian army-surgeons in the treatment of remittent and other malarial fevers of the most malignant types, in malarial neuralgias, acute nervous exhaustion, and sudden collapse without organic disease.

Poisoning.—The heart and the arterial tension are somewhat stimulated by small doses, but depressed by large ones (40 to 80 grains), which slow and enfeeble the pulse by direct action on the cardiac ganglia. The brain is rendered hyperemic and exhilarated by small or moderate doses, but large ones produce a sense of fulness and constriction in the head, cerebral anemia, pallor, tinnitus aurium, vertigo, staggering gait, amaurosis and deafness, great headache, dilated pupils, delirium, coma, and, in animals, convulsions. The eyes and ears are very rarely injured permanently. These symptoms collectively are termed CINCHONISM (*q. v.*).

Preparations.—**Quinina,** a white, amorphous or minutely crystalline powder, of alkaline reaction and very bitter taste, soluble in 1670 of water and in 0.6 of alcohol at 59° F. and readily in dilute acids. Dose, 1 to 20 grains, or 40 grains in special cases. Is insoluble in saliva. **Q. Bisulphas,** clear, colorless efflorescent crystals or small needles, of very bitter taste and strongly acid reaction, soluble in 10 of water with blue efflorescence, and in 32 of alcohol at 59° F. Dose, 1 to 20 grains, or even 60 grains in special cases. **Q. Hydrobromidum,** colorless needles, of very bitter taste, soluble in 54 of water and in 0.6 of alcohol at 59° F., very soluble in boiling water and in boiling alcohol. Dose, 1 to 20 grains. **Q. Hydrochloridum,** white needles in tufts, of very bitter taste, soluble in 34 of water and in 3 of alcohol at 59° F., in 1 of boiling water or alcohol. Dose, 1 to 20 grains. An excellent salt which should be more generally used; 5 to 10 grain doses are antipyretic. **Q. Hydrochloridum Acidum** (B.P.) is soluble in less than its own weight of water, and may be used hypodermically. Dose, 1 to 10 grains. **Q. Salicylas** is soluble in 77 of water, in 11 of alcohol, in 37 of chloroform, and in 110 of ether, at 77° F. It contains 70 percent of quinin. Dose, 1 to 20 grains in pill or capsule, **Q. Sulphas,** very light, snow-white, fragile crystals. of bitter, persistent taste, soluble in 740 of water and in 65 of alcohol at 59° F., more soluble in acidulated water. Dose, 1 to 20 grains, or even 40 grains in special cases. **Tinctura Pyrexialis, Tinctura Antiperiodica,** or **Warburg's Tincture** (Unofficial) is a celebrated and formerly secret preparation. The formula, published by the originator, included over 60 ingredients, one of which (Confectio Damocratis) contained many drugs which are not now obtainable. The tincture contained quinin bisulphate, 2 percent, with aloes, rhubarb, camphor and several aromatic herbs. Dose, 1 ounce (about 9 1/2 grains of quinin bisulphate) in 2 doses given 3 hours apart. Hager's modification of the original formula is—quinin sulphate 1, Spt. camphoræ 2, Tinct. aloes et myrrhæ 22, alcohol 16. Dose, as above. Some of the preparations now sold under this name contain few, if any, of the original ingredients. The so-called *Warburg's Pill* is a most irrational form in which to administer this complex medicine, even if it contains the proper constituents. See CINCHONA, EUQUININ.

QUININ AND UREA HYDROCHLORID.—Quinin carbamid hydrochlorid or urea-quinin. Recently this drug has been highly recommended as a local anesthetic in operations on the nose and throat and in ano-rectal surgery. A 1 percent solution is injected locally or a 10 to 20 percent solution is applied locally to the mucous membranes. The resulting anesthesia is claimed to be considerably prolonged. As a palliative measure a 20 percent solution has been applied in tuberculous ulcers of the larynx with excellent results.

QUINSY.—See TONSILLITIS.

R

RABIES.—See Hydrophobia.

RACHITIS.—See Rickets.

RADIUM.—Radium is one of the newer elements. It is a radioactive substance, obtained from pitch blende, and discovered by Madame Curie and her husband in 1898. It is of high atomic weight; extremely rare and expensive, being almost unobtainable in the pure state. It is of interest because of its wonderful radioactive emanations. These are of three kinds, and are designated as the *Alpha*, *Beta*, and *Gamma* rays. The *Alpha rays* have very slight penetrating qualities and are chiefly or entirely absorbed by the container. The *Beta rays* are the most numerous and have only a moderately penetrating effect, being absorbed chiefly by the skin and subcutaneous tissue. The *Gamma rays*, on the other hand, correspond rather closely to the Roentgen rays, and are very penetrating, probably more so than the Roentgen rays.

Therapeutically its exact value has not yet been determined, but it has been used successfully in the treatment of various obstinate skin diseases, such as epithelioma, rodent ulcer, and nevus. It has also been used with some degree of success in the treatment of deep-seated malignant disease, particularly when located in the cavities, which are not easily reached by the Roentgen rays.

It is used as a paste for external applications, or in tubes. These tubes are often introduced into cavities; or even, by surgical means, into the tumors themselves.

RADIUS.—See Forearm.

RAILWAY INJURIES.—These are of greatest interest from their medicolegal aspect. Trivial railway injuries might be immediately followed by loss of memory, defective sight, pain in the back, and the usual symptoms of nerve shock, and subsequently by the most formidable array of nervous symptoms. On the other hand, very severe injuries may be followed by prompt and complete recovery. The more serious results are dependent upon the great weight and impulse of the train, the sudden arrest of momentum, and direct traumatism. Serious spinal injuries and violent shock have occurred to persons sitting in a train not in motion that has been struck by a moving train from behind. It is the sudden and violent character of the occurrence, the alarm and fright, the general jar and commotion of the whole body, and possible local damage that make the main features of railway injuries.

Direct results of railway accidents are various, but ligamentous lesions are perhaps the most characteristic. Death has resulted from sheer fright. The indirect results are also numerous and varied. It must always be borne in mind that a chronic inflammation may be lighted up by an accident; syphilitic, gouty, tubercular, and even cancerous diseases may follow and complicate the symptoms arising from the injury. Chronic inflammatory conditions of the cord or its membranes may be induced. Certain indefinite phenomena constantly render the diagnosis and prognosis of railway injuries difficult. When no local lesion of importance exists, neurasthenic conditions are likely to occur which are doubtless expressions of an exhausted nervous system. The temperature in these cases is often subnormal and the pulse slow. Asthenopia, with difficulty in, or real loss of the power of, accommodation, may impair the vision. Physical changes in the retina and optic disc are extremely uncommon, and generally follow organic lesions of the spinal cord and membranes. Functional disturbances, probably of cerebral origin, are often added to this neurasthenic condition, and in such cases there are frequently medicolegal controversies. The common "railway spine" is considered under the head Spinal Cord (Injuries) (*q. v.*).

Every medical attendant, as well as medical officer of any railway, should familiarize himself with all the circumstances of an accident and its results. Apart from the accident itself, the approximate speed of the train, the position of patient in the carriage and of carriage in the train, the presence of other uninjured passengers, the condition from the time of the accident to the time of examination, and the symptoms complained of, should be noted fully and filed away for reference. The general condition of the patient, especially as to appetite, capacity for work or sleep, and previous habits, the possible existence of organic disease, and the condition of urine are to be investigated. Bruises or signs of local injury are to be noted, and when injury to the spine is alleged, the amount of mobility or rigidity noticed when undressing, the effects of digital pressure or percussion, and the application of hot or cold sponges should be noted. The circumference of limbs should be measured, the electric excitability of muscles tested, the existence of spasm or tremor and the condition of reflexes, superficial and deep, ascertained. Cutaneous sensibility should be investigated, and an ophthalmoscopic examination may be made to determine the existence of local lesions of the fundus.

The medical attendant should form an opinion on the following points: Has the patient been really injured? What is the nature of the injury? Is the injury a possible or probable result of the accident as described? Are the symptoms consistent with the history and objective signs?

Railroad surgeons are usually given sufficient directions by the corporation that employs them, according to the views of their chief officers or in compliance with the law prevailing in the district where such accidents may occur.

The treatment of railway accidents is mostly surgical, and differs in no way from the treatment of similar injuries received in other ways, and which are fully discussed in other portions of the book under their various headings. Immediate treatment, even by the train crew and passengers, is necessary. Hemorrhage should be prevented by the prompt application of pressure. A handkerchief, belt, or suspender tied around a limb or twisted tight by a stick, or direct pressure with the finger, will usually suffice.

Fractures should be placed in improvised splints from umbrellas, walking-sticks, cushions, newspapers, broken pieces of wood, etc., and fixed by straps or suspenders, handkerchiefs, etc.

Simple dislocations should be reduced as early as possible, and simple fractures prevented from becoming compound.

Shock, collapse, and fright require great caution to maintain the vital powers until reaction sets in. The temperature of the body, the strength and rate of the heart's action, together with the respiration, are to be maintained by external warmth and by internal stimulants. Overstimulation is also to be guarded against. See COLLAPSE, SHOCK.

Exposure to cold and wet should be prevented and shelter provided as soon as possible, followed by early removal to a hospital or place of rest. Subsequent treatment of railway injuries requires absolute rest for a long time, especially if spinal lesions are suspected; change of scene and moderate exercise often are beneficial, especially when neurasthenic conditions supervene. See ABDOMEN (Injuries), CHEST (Injuries), FRACTURES, SPINAL CORD (Injuries), SPINE (Injuries), etc.

RAILWAY SPINE.—See SPINAL CORD (Injuries).

RALES.—The sounds caused by the breaking of air through impediments or passing over obstructions in the lungs and bronchi. They vary in character according to the consistency of the surrounding lung tissue. Sometimes a distinction is made between râles and rhonchi. The first word is applied to sounds generated by vibrations set up in fluids; the second, to sounds generated in the narrowed or obstructed lumen of tubes. See CHEST (Examination).

RALES, TABLE OF.

VARIETY.	WHEN HEARD.	HOW AND WHERE PRODUCED.	SIZE AND CHARACTER.	CONDITION IN WHICH HEARD.
Amphoric.....	Inspiration and expiration.	By movement of air in a tense-walled cavity containing air and communicating with a bronchus.	Large, musical, and tinkling.	In tuberculous and abscess cavities.
Bubbling, large.	Inspiration and expiration.	By passage of air through frothy mucus in the trachea and larger bronchi.	Larger than the medium bubbling; moist.	Bronchitis and pulmonary engorgement.
Bubbling, medium.	Inspiration and expiration.	By passage of air through mucus in the larger tubes.	Larger than the small bubbling; moist.	In capillary bronchitis especially in children.
Bubbling, small.	Inspiration and expiration.	By passage of air through mucus in the bronchioles.	Small; moist; like the bursting of soft bubbles.	In capillary bronchitis, especially in children.
Cavernous....	Inspiration and expiration.	By passage of air through a small cavity with flaccid walls, which collapse with expiration.	Hollow and metallic....	In the third stage of pulmonary tuberculosis.
Clicking......	Inspiration only....	By passage of air through softening material in smaller bronchi.	Small; sticky..........	The apex in pulmonary tuberculosis.
Consonating...	Inspiration and expiration.	When bronchial tubes surrounded by consolidated tissue.	Bright, clear, ringing...	Tuberculous pneumonia.
Crackling, dry.	In inspiration......	By the breaking down of lung tissue.	Sharp, short, and clicking.	In the second or softening stage of pulmonary tuberculosis and in pulmonary gangrene.
Crackling, large.	Inspiration and expiration.	By fluid in very small cavities...	Larger than the medium crackling; dry.	In pulmonary tuberculosis and pneumonia, after formation of small cavities.
Crackling, medium.	Chiefly in inspiration.	By fluid in the finer bronchi.....	Larger than the small crackling; dry.	Softening of tuberculous deposit or pneumonic exudation.
Crackling, small.	Chiefly in inspiration.	By fluid in the finer bronchi.....	Small; dry; like the breaking of small shells.	Softening of tuberculous deposit or pneumonic exudation.
Crepitant.....	End of inspiration only.	By passage of air into vesicles collapsed, or containing fibrinous exudation. Usually at the base of the lungs.	Small; like rubbing the hair between the fingers.	Pneumonia, early stage; edema of lungs; hypostatic pneumonia; localized in pulmonary tuberculosis.

RALES, TABLE OF.

VARIETY.	WHEN HEARD.	HOW AND WHERE PRODUCED.	SIZE AND CHARACTER.	CONDITION IN WHICH HEARD.
Dry	Inspiration and expiration.	By narrowing of the bronchial tubes from thickening of the mucous lining, from spasmodic contraction of the muscular coat, viscid mucus within, or pressure from without.	Large and sonorous, or small and hissing, or whistling.	In bronchitis, asthma, and localized in beginning pulmonary tuberculosis.
Extrathoracic.		In the trachea or larynx.		
Friction	Inspiration and expiration; most distinct at the end of inspiration.	By the rubbing together of serous surfaces, roughened by inflammation or deprived of their natural secretion.	Grazing, rubbing, grating, creaking, or crackling.	In pleurisy and pericarditis.
Gurgling	Inspiration and expiration.	By the passage of air through fluid in cavities, on coughing.	Larger than the large bubbling; moist; like the bursting of large bubbles.	Pulmonary tuberculosis, after formation of cavities.
Guttural		In the throat.		
Moist		By the passage of air through bronchi containing fluid.		
Mucous (of Laennec).	Inspiration and expiration.	By viscid bubbles bursting in the bronchial tubes.	A modification of the subcrepitant.	Pulmonary emphysema.
Râle redux, râle de retour.	Inspiration and expiration	By the passage of air through fluid in a bronchial tube.	Crackling and unequal..	In pneumonia in the stage of resolution.
Sibilant	Inspiration and expiration.	By narrowing of the smaller bronchi from viscid mucus adhering to the walls, from thickening of the lining membrane or spasmodic contraction.	High-pitched and even hissing or piping.	In bronchitis, asthma, and localized in beginning pulmonary tuberculosis.
Sonorous	Inspiration and expiration.	By lessened caliber of the larger bronchi, from spasm, tumefaction of mucous lining, or external pressure.	Low-pitched and snoring.	Most frequent in bronchitis and spasmodic asthma, but may occur in any pulmonary disease.
Subcrepitant..	Inspiration and expiration.	By passage of air through mucus in the capillary bronchial tubes.	Small; moist	Capillary bronchitis
Subcrepitant (of Hirtz).	Inspiration and expiration.	By passage of air through mucus in the capillary bronchial tubes.	Moist; metallic.	Tuberculous softening.

RANULA.—A cystic tumor beneath the tongue, connected with the duct of the sublingual salivary gland.

Varieties.—*True ranula*, found in the floor of the mouth, from the size of a walnut to a pigeon's egg, and containing glairy, tenacious contents.

Mylohyoid, found between the mylohyoid and buccal mucous membrane, often as large as an orange, and filled with cheesy contents.

Etiology.—The common form of ranula has thin walls, and contains a fluid somewhat resembling saliva, and hence formerly supposed to be a dilatation of the duct of the submaxillary gland. It may be that this is true in those instances in which the duct is occluded by a salivary calculus, but in the majority of cases the ranula appears to be a distinct cyst.

Symptoms.—If the ranula has attained some size before it is noticed, it may be large enough to crowd the tongue against the hard palate, so that swallowing is interfered with, and sometimes even breathing becomes difficult, especially if there is concomitant coryza; or there may be convulsive attacks of dyspnea, simulating croup.

Prognosis is favorable, though the disease is prone to recur; rarely spontaneous cures have been known to follow suppuration.

Treatment.—If complicated with croupy attacks, the following operation should be immediately performed: Open the sac sufficiently to cauterize thoroughly its inner walls, which must be repeated often enough to prevent union, except from the bottom of the sac. If this is not obtained, relapses will occur.

RAPE.—The carnal knowledge by a boy or man of a female forcibly and unlawfully and without her conscious and free consent. If a woman is incapable of giving consent, as in idiocy, imbecility, or any mental unsoundness, either temporary or permanent, sexual intercourse with her is rape. If at the time of the act the victim is unconscious of the nature of the act, and this fact is known to the defendant; if her resistance is forcibly overcome or prevented by fear of immediate and great bodily harm, which she has reason to believe will be inflicted upon her; or if she is prevented from resisting by stupor or mental weakness produced by intoxicating, narcotic, or anesthetic agents administered by or with the privity of the person accused of the crime, the offense constitutes rape. It is immaterial whether the victim is a virgin or a common prostitute.

Age of consent is the age below which a female is incapable of giving legal consent to sexual connection, and such connection on the part of a man is rape, in spite of her consent or desire.

The age of consent in the various States is given in the following table (compiled by the New York Society for the Prevention of Cruelty to Children):—

State.	Age of Consent.				
	12	14	15	16	18
Alabama		14			
Arkansas				16	
California				16	
Colorado				16	
Connecticut				16	
Delaware					18
Florida					
Georgia		14			
Idaho					18
Illinois				16	
Indiana				16	
Iowa			15		
Kansas					18
Kentucky	12				
Louisiana					18
Maine				16	
Maryland				16	
Massachusetts				16	
Michigan				16	
Minnesota				16	
Mississippi		14			
Missouri					18
Montana					18
Nebraska					18
Nevada					18
New Hampshire				16	
New Jersey		14			
New York					18
N. Carolina		14			
N. Dakota				16	
Ohio				16	
Oklahoma				16	
Oregon				16	
Pennsylvania				16	
Rhode Island				16	
S. Carolina		14			
S. Dakota				16	
Tennessee					
Texas			15		
Utah					18
Vermont				16	
Virgina	12				
Washington				16	
W. Virginia					
Wisconsin					18
Wyoming					18

Indecent assault may include various factors of an attempt to commit rape, comprising, in the case of a child, putting the hands on the external genitals or even feeling the legs.

Legal rape may be committed only when there is physical capacity in the direct perpetrator. A boy under 14 cannot commit rape according to the law in some countries and States, and no evidence is admissible if he is under that age, even though the fact could be shown that he had capacity. The presumption of capacity is rebuttable in Ohio, Massachusetts, New York, and Tennessee.

A boy under 14 cannot be convicted of rape in California, but in North Carolina and Florida courts the English law is followed. In Louisiana there is no foundation for the presumption of incapacity. Here the law conforms to the medical knowledge. It is not essential to prove emissions, as mere touching of the vulva by the penis suffices to establish the fact of carnal knowledge.

If the victim is under years of discretion, her evidence, even when unsupported, if believed by the jury sufficient to leave no reasonable doubt of guilt, will justify a conviction.

It is a matter of doubt whether rape is possible upon a woman of fair size and strength when committed by an unaided man. If in the enjoyment of her faculties, she is capable of offering an amount of resistance well-nigh insuperable, and if she has offered a decent resistance, the person of the ravisher should bear evidence of it. Rape is most often committed on children of tender-years, but it is well to be on one's guard against error. Purulent discharges from the vagina are not uncommon in ill-fed, dirty, and scrofulous children.

The *medical evidence* is based on: (1) Marks of violence about the woman's genital organs; (2) wounds, bruises, or other marks of injury on the woman or on the accused; (3) blood stains and seminal stains on the person or clothing of either party; and (4) the presence of any venereal disease on either party.

For examination for spermatozoa, see SEMINAL STAINS.

RASH.—See EXANTHEMS, SKIN-DISEASES.

RATION, EMERGENCY.—One with high force-value and with sufficient available nitrogen for the needs of hard labor, prepared in compact form and designed for occasions when the use of the regular ration is impracticable.

UNITED STATES ARMY EMERGENCY RATION.

	QUANTITY (IN OUNCES)	PROTEIN (GRAMS).	FATS (GRAMS).	CARBOHYDRATES (GRAMS).	FULL VALUE (CALORIES).
Hard bread,	16.	70.76	5.89	332.94	1.712
Bacon,	10.	24.94	218.14	....	2.030
Pea meal,	4.	24.94	2.25	59.84	.368
Coffee, roasted and ground, with four grains of saccharin,	2.				
Or tea, with four grains of saccharin,	.5				
Salt,	.64				
Pepper,	.04				
Tobacco,	.5				
	33.68	126.64	226.28	392.78	4.110

RAY FUNGUS.—See ACTINOMYCES.

RAYNAUD'S DISEASE (Symmetric Gangrene;

Sphaceloderma).—A rare disease, characterized by a local stagnation occurring at the periphery of the circulation, producing symmetrically distributed gangrenous spots on the body. The disease occurs in 3 well-defined grades, which are, in the order of severity, *local syncope*, *local asphyxia*, and *local gangrene*. The so-called "*dead finger*," frequently seen in females, is an example of the first grade.

Local syncope is observed most frequently in the extremities, and produces the condition known as dead fingers or dead toes; it is analogous to that induced by intense cold.

Local asphyxia, which usually follows local syncope, but may develop independently. Chilblains are the mildest manifestation of this condition. The fingers, toes, and ears are the parts usually affected. In the most extreme degree the parts are swollen, stiff, and livid, and the capillary circulation is almost stagnant.

Local or Symmetric Gangrene.—The mildest form follows local asphyxia. Small areas of necrosis appear on the pads of the fingers and of the toes, also at the edges of the ears and tip of the nose. Occasionally, symmetric patches appear on the limbs or trunk, and in severe cases terminate in extensive gangrene.

Raynaud suggested that the local syncope is produced by contraction of the vessels; the asphyxia is probably caused by dilatation of the capillaries and venules, with persistence of the spasm of the arterioles. The condition is probably due to some disturbance of the vasomotor nerve-center or in some instances to a peripheral neuritis. Two forms of congestion occur, which may be seen in adjacent fingers, one of which may be swollen, intensely red, and extremely hot; the other swollen, cyanotic, and icy cold (Osler).

Pain is the most prominent symptom of the disease, which usually attacks children or adults under 30 years of age. Women of the neurotic temperament are more liable to be affected, and especially does it occur after some sudden mental shock. The disease is frequently associated with hemoglobinuria. Scleroderma and edema, probably angioneurotic, may be observed. There may also be cerebral symptoms, impaired vision, arthritic swelling, tingling and formication due to peripheral neuritis.

Treatment.—When seen early, galvanism, with one electrode applied to the spine and the other immersed with the affected part in water, is the best treatment. Friction with stimulating liniments, as for frost-bite, is also of value. Nitroglycerin is highly recommended. See GANGRENE.

REACTION OF DEGENERATION.—See DEGENERATION (Reaction), NERVOUS DISEASES (Examination).

RECTOCELE.—Protrusion of the anterior wall of the rectum and posterior wall of the vagina into the vagina or through the vaginal ostium. The condition is due to injury of the perineum that takes away the support of the posterior vaginal wall. The bulging of the vaginal wall causes a distinct tumor, which is readily recognized on separation of the vulva. Straining or bearing-down efforts cause an increase in the size of the tumor. The patient feels during defecation as though the feces were about to pass through the vagina. Pressure on the rectocele will easily replace it.

The treatment of rectocele consists in repair of the perineum by Emmet's operation. See PERINEUM.

RECTOVAGINAL FISTULA.—See VAGINAL FISTULA.

RECTUM, ABNORMALITIES.—The only congenital malformation needing mention here is imperforate anus. The anus may be entirely absent; it may be present but separated from the rectum by a membrane; or the rectum may open into the bladder, prostatic urethra, or vagina.

Treatment.—When only a thin membrane intervenes, its division is all that is necessary. When there is no apparent outlet to the rectum, careful dissection is made upward to the bowel from a spot where the rectum is normally situated. Mayo Robson advises continuing the dissection in the perineum, opening the peritoneum, pulling the end of the gut down and fixing it to the skin. In some cases left inguinal colotomy is necessary. See ANUS (Preternatural).

RECTUM, ADMINISTRATION OF MEDICINE BY.—See MEDICINES (Administration).

RECTUM, EXAMINATION. Interrogation.—After the patient has concluded the description of the ailment, the following are the principal queries which may be asked with advantage (Adler):

1. **In Reference to Pain.**—Is there any pain? If so, of what character? Is it situated in the rectum? What is its relation to the act of defecation? Is it worse during an evacuation, shortly afterward, or some time after the movement? Is itching, a sense of fullness, or heat experienced?

2. **Regarding Protrusion.**—Is there any swelling or protrusion at the anus? Does this occur only at defecation, or is it independent of this act? Does it bleed? Does it go back spontaneously, or has the patient to return it?

3. **As to the Presence of a Discharge.**—Is there any discharge? If so, what is its nature (bloody, mucous, or purulent)? Is it offensive? Does it occur before or immediately after defecation, or is it independent of the action of the bowels?

4. **As to the Regularity of the Action of the Bowels.**—Is there a daily movement, or does constipation or diarrhea exist? What is the character of the fecal evacuation as to color, size, and consistence?

5. **General Interrogations.**—Does the patient cough, have night-sweats, spit blood, or has there been a loss of flesh? What are the habits of life, especially with reference to the use of alcoholic liquors, tobacco, and to indulgence in venery? Is there any specific history? Lastly, inquire as to any hereditary tendency to rectal trouble, malignant disease, kidney, liver, or heart affection. In women inquire into the condition of the sexual organs, etc. Whenever the idea of any operative procedure is entertained, the urine should be examined, and a thorough physical inspection of the patient made.

Having obtained the subjective symptoms and being satisfied as to the existence of rectal disease, we proceed to confirm the provisional diagnosis and to obtain positive information upon which to base the prognosis and to guide the treatment by making a thorough local examination. If possible, the patient should have the bowel emptied by an enema immediately before an examination is attempted. In the case of female patients especially the neglect of this will often render a thorough investigation impossible, without recourse to anesthesia, owing to the fear of an accident occurring—such as the escape of flatus. Under such circumstances the sphincter muscles may be so tightly closed that the surgeon is frustrated in the attempt to explore the parts. When a specular examination is necessary, as in the case of an investigation of the higher portions of the rectum or of the sigmoid flexure, it is absolutely essential that the contents of the bowel are removed.

Postures.—There are various postures in which this examination may be made. Some surgeons prefer the patient to lean over the back of an ordinary chair; others, to have them kneel upon a table with the head of the patient placed on his folded arms, by which means the buttocks are elevated and the intestines are allowed to gravitate from the seat of investigation; others, the lithotomy position; but for general use Adler thinks that the most comfortable as well as the most delicate posture for the patient, and that most convenient for the examiner, is for the patient to lie on a firm couch on the left side, the right shoulder turned away from the surgeon, the left arm brought behind the body, and the right thigh well flexed upon the abdomen. In examining for the presence of strictures or growths situated above the lower 4 inches of the rectum, by directing the patient to stand and strain, the diseased part will be brought nearer to the anus, so that at least an inch or more of the bowel may be explored than can be done when the patient assumes the usual position, even though directions are given to bear down.

Light.—Either natural or artificial light may be used. By means of a head-mirror (the operator sitting facing the light and the patient's back being from the same) the light may be concentrated upon any particular point requiring observation.

The instruments usually required are: A flexible probe made of silver, useful for the exploration of fistulous tracks; an exploring needle, or a small trocar, by means of which can be ascertained the nature of the contents of any swelling or fluid collection; Kelly's short and long proctoscope and his sigmoidoscope; sponge-holders; basins; and possibly a hypodermic syringe, with a flexible silver cannula attached, which is useful in detecting whether a fistula is complete or otherwise. Plenty of towels and cotton should be on hand.

Inspection of the Condition of the External Parts.—On separating the buttocks, the orifice of the anus will come into view. The radiating folds should be separated by the fingers, and cracks, excoriations, and fissures should be looked for. External hemorrhoids will also be noted, if present. By passing the finger around the anus and making pressure, any induration that exists will be detected; this may be due to a fistula or an abscess. If the parts are covered with a discharge, it should be wiped away and its source traced, as to whether it is from an external opening of a fistulous track, etc. Eruptions of any kind—eczematous, syphilitic, or otherwise—must also be noticed.

Digital Examination of the Interior of the Rectum.—The method of making the examination is as follows (Adler): The nail of the index-finger, being well-trimmed and the finger lubricated with carbolized linseed oil, is introduced into the bowel by a slow boring motion, in a direction at first slightly forward. This should be done gradually, so as to allow the sphincters time to relax; if attempted too hurriedly or in too forcible a manner, spasm of the muscles will to a certainty be induced. As the finger enters, the condition of the sphincters is noted. The strength, measured by the power of resistance, will be found to vary greatly in different people. In the aged or debilitated it is likely to be very weak; and just the reverse in the strong and healthy. In persons of a specially nervous tendency and in cases of irritable ulcer of the anus, a contraction may be met with, which, owing to the pain, will render an examination impossible without the use of an anesthetic.

The finger should now be passed its full length up the bowel, unless an obstruction exists, and by instructing the patient to bear down forcibly the rectum can be explored for a considerable distance. Additional length may be gained by passing the other fingers of the examining hand backward along the intergluteal groove, instead of closing them in the palm, as is generally done, and pressing the knuckles against the soft parts. The knuckles, in the latter procedure, prevent the full passage of the index-finger. In this manner about 3 1/2 or 4 inches of the rectum may be explored, together with the prostate, the neck of the bladder, the uterus, the anterior surface of the coccyx and the lower part of the sacrum, the ovaries and tubes, and the broad ligament. With an exceptionally long finger it may be possible to feel the seminal vesicles and the vasa deferentia.

In making an examination of the rectum it must be borne in mind that frequently two or more rectal affections coexist: as, for instance, a polypoid growth complicating a fissure, or malignant disease existing with fistula and hemorrhoids, etc.

Malignant infiltration, or stricture, can be detected if situated within reach. By sweeping the finger around the mucous membrane, its condition can be noted: a general smoothness, and absence of the normal folds indicating atony; ulceration can be recognized, and the attachment of polypi can be felt. In examining for a polypus it is important that the finger should be brought from above downward; as otherwise the growth may be pushed out of reach owing to the length of the pedicle, which is often considerably elongated. Fecal masses in the rectal pouch can be recognized without difficulty.

The finger is now to be partly withdrawn, passing the palmar surface around the entire surface of the mucous membrane as this is done, in order to note the existence of internal openings of fistulæ, the seat of ulcers, etc. As the outlet of the bowel is approached, internal piles may be perceived; but the fact should always be remembered that unless they are thickened by inflammatory changes they are extremely hard to recognize by the touch; in point of fact, the sensation conveyed to the finger is more apt to deceive the surgeon than any other rectal trouble.

The Use of the Speculum.—In the large majority of rectal diseases digital and ocular examination is sufficient for purposes of diagnosis; but for some cases the use of the speculum is desirable. This instrument is made in a variety of forms; the length of the tube to be selected depending on the portion of the bowel to be explored. Before being introduced into the rectum the speculum should be warmed and well-lubricated; it should then be inserted into the anus, and gently but slowly directed a little forward and upward for a distance of about an inch, as if to pass from the perineum to the umbilicus, in order that it may follow the course of the anal canal; having reached this depth, which is somewhat greater in the male than in the opposite sex, the point should be inclined backward, first slightly, and afterward to a greater extent, until the instrument is fully inserted. Should the interior view of the rectum be obstructed by blood, mucus, or feces, a mop of cotton attached to a holder, made for the purpose, should be used to cleanse the parts. With these instruments the interior of the rectum and the sigmoid flexure can be examined, and the exact condition of affairs ascertained. Some forms of speculum are furnished with blades or plates, which can be separated to the requisite extent by means of a screw attachment.

The use of the rectal bougie for diagnostic purposes Adler condemns. The introduction of these instruments is one of considerable difficulty, and requires greater practice than the passage of a urethral catheter; the danger of perforation is as great, and the result of such an accident is very much more serious, than in the urethra. In one case a fatal peritonitis will likely be started, while in the other a false passage will probably be the sequence. The use of the Kelly tube has obviated the necessity of employing the rectal bougie for the purpose of diagnosis.

Rectal Eversion as a Means of Diagnosis.—In examining the rectum in females, Stover has recommended eversion of the bowel by the fingers placed into the vagina. This method is useful in women who have borne children, but not in the young and unmarried. A portion of the anterior wall may thus be exposed.

The introduction of the hand into the rectum is a procedure which may be a means of exploration open to the surgeon, but it is doubtful if the amount of information obtainable by its use is sufficient to warrant the practice.

Exploration with a silver probe 7 or 8 inches in length is of value in detecting blind, external, internal, or complete anal fistula. Being flexible, it may be bent to any desired form.

Injections of various fluids, such as peroxid of hydrogen, a 2 percent solution of creolin, milk, or a weak iodin solution, often serve a useful purpose for detecting the internal opening of a fistulous tract.

RECTUM, INFLAMMATION (Proctitis).—**Catarrhal inflammation** of the mucous membrane may arise from various causes: Gonorrheal infection, especially in women; syphilis during the secondary stage; abuse of purgatives; gout; errors in diet, etc. Except when it is due to the first of these, it is rarely severe; there is a sense of heat and weight in the perineum, with a constant desire to defecate. The sphincter is in a state of painful spasm; the anus is hot and tender; the amount of mucus is increased, and this, escaping externally, leads to excoriation and perhaps superficial ulceration. As a rule, the symptoms subside as the cause is removed; sometimes, however, they become chronic; and occasionally, when severe, painful catarrhal ulcers develop, requiring special treatment.

Ulceration of the rectum is much more serious, not only for itself but from the way in which it leads to stricture and fistula. In some cases it is the result of injury, the introduction of foreign bodies, the use of enema tubes, or the passage of hard scybalous masses, especially as the circulation is often sluggish and the tissues badly nourished from the presence of varicose veins. In others it arises directly from thrombosis and inflammation of the veins, or from dysentery involving the rectum as well as colon. When this occurs, the ulcers formed are of a peculiarly irregular character; they spread in all directions, forming little islands, which, as cicatrization takes place, stand out as hard warty excrescences; or they undermine the mucous membrane, so that it leaves rigid cords passing across the interior from one part to another; and the scars are of such extreme density that not improbably many of them have been mistaken for scirrhus.

In other cases ulceration is due to syphilis. In its earlier stages this attacks the anus chiefly; condylomata and superficial sores occur around the margin, leaving irregular folds of skin between which are painful fissures, not unlike those at the angles of the nose and mouth. In the latter it breaks out on the mucous membrane, some distance from the anus, forming deep serpiginous sores, which may extend almost around the bowel. Tubercle is still more common, beginning in the adenoid tissue between and beneath the follicular glands. Little nodules make their appearance first, not larger than millet seeds, and only slightly raised above the surface; after a time these become caseous and break down, leaving shallow depressions, which grow larger and deeper, until at length they become circular sores with overhanging edges. In other cases the caseous deposit seems to infiltrate the adenoid tissue in the mucous and submucous layers before the surface gives way, and deep, irregular ulcers are formed, which almost at once become the orifices of tuberculous fistulæ.

Ulceration somewhat similar in character is not infrequently associated with albuminuria; probably it originates as catarrhal inflammation; after a time the lymphatic follicles become affected and break down; and then, as there is no longer any protection against septic infection, the deeper tissues become inflamed as well. In many cases it is difficult to distinguish this from the preceding; they both occur in patients whose health has failed and whose tissues are badly nourished; and they both lead to ulceration, and not infrequently to fistulous channels of very much the same description. In addition to these lupoid ulceration may attack the skin around the anus and the mucous membrane of the rectum. It is essentially destructive in character, and cicatrization is unusual. The edges and base are not hard, as in malignant disease; and the former are undermined and overhanging. Sometimes it remains stationary for a time, and is apparently beginning to heal; then it all breaks down again. It is only met with in tuberculous subjects, and probably is itself tuberculous. The only treatment that has proved of any use is scraping and the actual cautery; sometimes the pain, at least, can be relieved in this way for a time.

Symptoms.—In acute inflammation of the rectum the patient complains of a sense of heat and weight in the perineum, spreading over the back and thighs, and of violent straining and spasm of the sphincter. The skin is dry and feverish; the anus is very tender; the finger, if it is introduced, is tightly gripped; and the mucous membrane feels burning hot. In severe cases the constitutional symptoms are very marked; the pain radiates over the whole of the lower part of the body, and there is nearly always retention of urine.

The symptoms of ulceration depend upon its situation. When the anal margin is involved, they are so striking and so severe that this affection is described as *fissure of the anus* (see ANUS (Fissure)); when, on the other hand, they are higher up—above the level of the external sphincter—they are at first very vague. Diarrhea is the most prominent; as soon as the patient gets out of bed there is an immediate desire to go to the closet, and a small quantity of liquid feces, with some mucus like white of egg, comes away. The same thing occurs perhaps once or twice in the morning; and then, if the ulceration is not far advanced, the rest of the day is passed in comparative comfort; the rectum is empty and there is nothing to irritate it. In all but the slightest cases, however, there is a constant sense of fulness and tenesmus; normal motions are never passed; the amount of discharge increases; it loses its simple mucous character, and becomes dark, like coffee-grounds. Control over the sphincter is lost; the skin around the anus is constantly moist; it becomes covered with vegetations and excrescences, between which fissures form. Then the pain becomes more severe; after each motion it is intense, and in the intervals there is always a constant dull aching. Finally, the diarrhea becomes almost continuous; health and strength fail; the appetite is lost; colicky spasms and pains over the lower part of the abdomen grow more frequent; abscesses and fistulæ form around the bowel; the emaciation becomes extreme; and the patient sinks from exhaustion, if he is not carried off by some intercurrent disorder.

Diagnosis.—In advanced cases the appearance of the anus at once suggests the presence of more serious mischief. The thickened and pigmented folds, with deep and painful ulcers in between, and the eczematous condition of the skin, can only be caused by long-continued irritation; but the diagnosis can be made only with the finger or the speculum. The former is usually sufficient; the latter can only be used with an anesthetic, and with either the utmost gentleness is essential. Immediately inside the anus the mucous membrane is generally unaffected, though both in syphilis and advanced tubercular or lupoid disease it may be nearly as bad as the rest; higher up, the normal soft character of the bowel is entirely lost. The surface is rough and irregular; hard nodules project here and there; in some places the walls are dense and thick, like stricture tissue, and the passage is narrowed; in others there are soft smooth patches, surrounded with overhanging edges, which bleed at the least touch; and the finger, when it is withdrawn, is smeared with blood-stained mucus. Sometimes it is possible from this alone to form an opinion both as to the extent and cause of the disease. Syphilitic ulceration is often accompanied by other signs; tubercle rarely leads to the formation of dense cicatrices, and fistulæ generally make their appearance very soon. Dysentery, on the other hand, may destroy all trace of normal mucous membrane, and often extends far beyond the reach of the finger. In the majority, however, a careful inquiry into the history and into the other symptoms that are present is essential; and even then it is sometimes difficult to exclude the idea of malignant disease.

Treatment.—Rest is the first consideration. The patient must lie down for at least the greater part of the day, with the foot of the bed raised to prevent venous congestion. The feces must be kept as soft and as small as possible; everything that is stimulating or indigestible, or likely to leave a bulky residue, must be strictly avoided. Pure milk diet for a time is often advantageous. All straining must be prevented; the bowel must be washed out night and morning with warm water or an astringent lotion—nitrate of silver in the case of dysentery, lotio nigra for syphilis; and after this a simple unirritating ointment (calomel—10 grains to about 1 ounce—subnitrate of bismuth, iodoform, or nitrate of mercury) may be applied, either as a suppository or with a suitable ointment introducer. Starch and opium injections are excellent means of controlling the diarrhea.

In the meanwhile constitutional treatment must not be neglected. Potassium iodid must be given in syphilitic cases. Cod-liver oil, if the patient can take it, often answers better than anything, as there is nearly always great loss of flesh and strength, and it tends to keep the motions soft; if iron is given, care must be taken that the bowels are not confined. In a few cases, when the ulcer is low down and the spasmodic contraction of the sphincter is severe, perfect rest may be obtained by subcutaneous division of the muscle or by stretching it; but this is seldom beneficial in the more severe forms. In these, when all local treatment fails, colotomy is the only resource (Moullin).

Periproctitis.—Inflammation around the rectum may occur at the anus, in the ischiorectal fossa, or higher up in connection with the insertion of the levator ani and the rectovesical fascia.

Inflammation around the margin of the anus in many cases is symptomatic of some deeper infection. There is a constant offensive discharge from the anus, the parts are continually moist, the epidermis is macerated, and the deeper papillary layer of the skin is exposed. Inflamed external hemorrhoids, small cutaneous boils, suppuration in connection with the hair follicles, and syphilitic eruptions are not uncommon. Of itself, it may be trivial in character, but it becomes of great importance from the tendency it has to leave behind it painful fissures and superficial fistulæ.

Ischiorectal abscess is more serious. It may be acute or chronic. In the former case the symptoms closely resemble those of proctitis. It may commence with a rigor; the pulse is quick, the tongue furred; there is the most intense throbbing in the perineum; sitting down is almost impossible; the rectum feels as if it was loaded with feces, but the least attempt at relief brings on the most violent pain and straining. On examination there is a hard brawny swelling by the side of the anus; the skin is red and edematous, pitting on pressure; and if the finger is introduced into the bowel, the hardness can be felt through the wall for some distance above. Sometimes the inflammation is even more acute than this, and a form of gangrenous cellulitis, which may prove fatal, sets in. In the chronic form, on the other hand, the swelling is painless, and often lasts for weeks. There is merely a soft, fluctuating swelling, filling the whole of the ischiorectal fossa and extending up by the side of the bowel, covered by a thin layer of discolored skin. Not infrequently the patient is almost unaware of its existence, and it may attain a very large size and burrow for a considerable distance before the skin gives way. When this happens, the opening is always large and ragged, with thin overhanging edges, like those of a scrofulous sore, and a fistula is almost certain to be left. The frequency with which these abscesses occur is accounted for by the ease with which septic absorption takes place through abrasions of the mucous surface, partly owing to the anatomy of the region. Owing to the rapid variations in size of the bowel, the tissues are badly supported; the circulation is feeble; there is a large amount of loose fat, with dilated veins; and the vessels have even a grearer tendency to become varicose than those of the lower extremities.

Phlegmonous inflammation is rare, except in patients who are thoroughly broken down; most of the cases recorded have been in persons who were suffering from specific fevers. Acute abscess may usually be traced to injury; perforation of the mucous membrane from the inside by a fishbone or other foreign body; tearing of the mucous surface from straining or the passage of hardened feces; or bruising of the subcutaneous tissue, leading to extravasation in the ischiorectal fossa or to venous thrombosis. The chronic form is probably due in a very large number of cases to the breaking down of tubercular deposit in connection with the adenoid tissue of the rectum; or it may be a complication of stricture, beginning either from an ulcer on the mucous surface or, independently of this, in the inflammatory exudation surrounding the bowel. In addition to this, suppuration may extend into the ischiorectal fossa from distant organs. Urinary abscess is not uncommon; necrosis of the sacrum or coccyx occasionally gives rise to it; coccygeal dermoid cysts may cause it; and it has been known in caries of the lumbar vertebræ.

Treatment.—Ischiorectal abscesses should be opened at once, and freely, or a fistula is almost certain to form. Even if there is merely a tense, hard, and painful swelling, it is better to run the risk of not finding pus. If the abscess is small and close to the rectum, so as to give rise to the suspicion that it is really intramural, the patient should be placed upon his side, with the knees drawn up, and the finger introduced into the bowel to fix the swelling and make it project toward the skin. Then a straight bistoury is introduced, and an incision, sufficiently free to give exit to the pus, made radially from the anus. Some of the outer fibers of the external sphincter are divided, to prevent the opening from closing too soon. True ischiorectal abscesses, on the other hand, must be laid freely open by a longitudinal incision, parallel to the anus, midway between it and the ischium; and as soon as the pus has escaped, the finger must be introduced, the cavity explored, and the partitions inside broken down. Afterward, the opening must be kept patent to insure the abscess healing from the bottom. Lint should be avoided, as the discharge is liable to collect behind it, and its removal is very painful. Guttapercha tissue, folded irregularly so as to fit inside the orifice without blocking it, is the most convenient. The cavity, if the dressing does not come away easily, can be syringed out behind it, and it does not absorb the discharge. The patient should be kept in bed, or at least lying down, until the abscess has healed. If it is an acute one this will not be many days; if it is chronic, the greatest care is necessary to prevent it degenerating into a fistula. The bowels should be well opened once, and then kept confined for several days, the diet being very light, so that there may not be an accumulation of feces. When they are opened, an effectual purge should be given to avoid straining.

Inflammation on the Visceral Surface of the Levator Ani.—This is nearly always caused by extension from some of the neighboring viscera, and if it involves the rectum, is nearly always associated with stricture. Occasionally it originates from the bowel; much more frequently from the uterus, following parturition or metritis, and probably it is for this reason that stricture of the rectum is so much more common in women than in men. The inflammation may be acute, attended with high fever, and soon ending in suppuration; or chronic, spreading from one part to another until they are firmly bound down to each other and to the pelvis by bands of cicatricial tissue, which may be almost of cartilaginous hardness. When it starts from the region of the uterus, the anterior surface of the rectum is first involved. The inflammatory exudation spreads into the substance of the muscles until the fibers become atrophied and the walls hard and unyielding; the mucous membrane becomes rigid and unable to unfold itself; the constant irritation caused by the passage of the feces gradually leads to hyperemia and thickening of the submucous tissue; and, at length, a definite stricture is formed, which may either be tubular in shape, extending for some distance along the bowel, especially on the anterior surface, or sharp, well-defined, and annular, about 1 1/2 or 2 inches above the anus. If suppuration occurs, the abscesses may break into the bladder or vagina, or they may extend through the sacrosciatic foramina, or even burst into the peritoneal cavity (Moullin).

RECTUM, INJURIES.—Injuries of the rectum occasionally occur from falls upon sharp-pointed bodies, or from incautious attempts to pass a long enema tube or bougie. Should the peritoneal cavity be perforated, death is the almost invariable consequence, especially if any injection has been absorbed by the peritoneum before the mistake is discovered.

Treatment.—Opening the abdomen, flushing out the peritoneum, and sewing up the rent in the gut affords the only hope of cure.

Foreign Bodies in the Rectum.—Foreign bodies o many differing kinds have at times been accident ally or intentionally introduced into the rectum. Fish-bones that have been swallowed not infrequently become impacted just within the anus, there giving rise to much irritation or pain, and often causing an ischiorectal abscess. The removal of some of these bodies, when of large size, is frequently attended with considerable difficulty, requiring an anesthetic, dilatation of the sphincter, and the use of various forceps, or even the passage of the whole hand.

RECTUM, PROLAPSE.—Prolapsus recti is the protrusion of the mucous membrane of the lower part of the rectum, and, more rarely, of the muscular coat as well, through the anus. It is most common in children, but may occur at any age.

The causes are either a relaxed state of the sphincter, induced by general weakness; residence in hot climates, etc.; or excessive straining due to stricture of the urethra, phimosis, stone, ascarides, constipation, piles, or polypus.

Symptoms and Diagnosis.—It commonly appears as an irregular ring of mucous membrane, or when much is protruded as a cylindric, elongated swelling. When recent, it has the color of healthy mucous membrane; but if not soon reduced it may become livid and congested, in consequence of constriction of the blood-vessels by the sphincter. The strangulation may proceed to such an extent that the prolapsed portion may undergo mortification and slough away. In old-standing cases it becomes indurated and leathery from exposure. It may be diagnosed from polypus by the presence of a central aperture, and from intussusception by the mucous membrane being continuous with that of the sphincter. In intussusception a sulcus exists between the protruded part of the bowel and the sphincter.

Treatment.—Should the bowel be protruded or strangulated, an attempt should be made to reduce it. If it has only been prolapsed a short time, this is easily accomplished by gentle pressure, the parts having been well smeared with vaselin, and the buttocks raised. When of longer standing, firm pressure must be exercised on it for 10 minutes or so, or the finger may be introduced into the orifice and the bowel pressed back. If reduction fails and the part is much inflamed, an ice-bag may be applied, and another attempt subsequently made, when, if still unsuccessful, nothing remains but to allow the protruded part to slough off or to excise it. If the muscular coat protrudes, no operation should be done, lest the peritoneum be wounded. Having reduced the bowel, the cause of the prolapse should, if possible, be removed; and to prevent a recurrence, the nates may be strapped together, or a pad and T-bandage worn, and the motions passed at bedtime instead of in the morning, the patient lying on his side or back during defecation. Astringent lotions or ointments of sulphate of iron, galls, or tannin should be applied, or the mucous membrane painted with nitrate of silver, while any pendulous folds of skin may be snipped off, so as to cause some amount of contraction of the anus. In the meanwhile the motions should be rendered soft with gentle laxatives. Should these means, after being well persevered in, fail, a more serious operation may become necessary. Comparatively recently the main active treatment of rectal prolapse consisted in chemical or thermal destruction of protruding mucous membrane or of portions of the dilated anus, the scar contraction incident to healing leading to narrowing of the anus and support of the gut. Strangulation of the protruding tissues by means of ligatures was also recommended and often gave good results. All such measures ought to be discarded, as chemical and thermal action are difficult to regulate and the strangulation by ligature is distinctly dangerous. There are three distinct principles, each of which is the base of a modern method of operative treatment.

1. When the prolapse is due to sphincteric atony or looseness, the principle of treatment is to overcome this condition by narrowing the sphincter.
2. When the prolapse is due to want of superior support, such support must be provided.
3. When there is excess of rectum and much tissue is prolapsed, the protruded mass should be excised. Generally this excision must be supplemented by narrowing the sphincter.

Thus according to the indications in the individual case plastic operations may be performed upon the sphincter ani, the lumen of the rectum narrowed, the rectum or sigmoid raised to a higher level and retained by sutures. The operation of sigmoidopexy, in which the peritoneal cavity is opened and the sigmoid flexure sutured to the abdominal walls is advocated by a number of surgeons. Excision of the prolapsed bowel is not advised.

RECTUM, STRICTURE.—Stricture of the rectum may be divided into the simple and the malignant.

The simple or fibrous stricture may be caused by the fibroid contraction of inflammatory products in the mucous and submucous coats, or of cicatrices following simple, syphilitic, or dysenteric ulceration; by injury, or operation on the bowel; or it may be the result of pelvic inflammations.

Pathology.—The stricture is generally situated from 1 to 2 inches from the anus, but may occur at any part. It may involve only a narrow, ring-like portion, when it is called annular; or it may include an inch or more of the gut, when it is sometimes spoken of as tubular. The strictured portion of the bowel consists in great part of fibrous tissue. The syphilitic variety is often combined with condylomata or ulceration about the anus, and the mucous membrane between the anus and the stricture is frequently ulcerated. The bowel above is generally distended with feces, the muscular coat hypertrophied, and the mucous membrane ulcerated; while in the neighborhood of the stricture the coats are often so thin that the least force causes them to give way. Fistulæ often form below the stricture, and hemorrhoids are a frequent concomitant.

Symptoms and Diagnosis.—Pain and difficulty in passing a motion, constipation, and, later, constipation alternating with diarrhea. The motions, when the stricture is near the anus, become small, ribbon-like, and streaked with discharge. There is a frequent desire to defecate, but little passes except gas and mucus, or pus, and the bowel feels as if it had not been emptied. In tight strictures or in strictures with ulceration fistulæ may sometimes form about the anus, and the patient gets worn out; and after many years, perhaps, of suffering may die of an attack of peritonitis or obstruction. The stricture is readily detected on passing the finger, but is often so tight that only the tip can be inserted. When this is the case, on no account should the finger be passed through it, as the slight force of passing the finger may rupture the attenuated walls, and peritonitis and death may follow.

Treatment.—As a rule, gradual dilatation by means of bougies should be first attempted, and will generally be successful; but the stricture must be kept dilated by the subsequent occasional passage of a bougie. In exceptional cases, when the stricture is very resistant, a bougie may be tied in. When the parts are much riddled by fistulæ, a division of the stricture may be necessary. This may be done by what is called internal or external linear proctotomy. In the former operation the knife, guided by the finger, is introduced through the stricture, which is then divided in a posterior direction; in the latter, the stricture, together with the external sphincter and other intervening soft parts, are completely divided down to the coccyx.

Malignant or Cancerous Stricture.—Cancer in all its forms may occur in the rectum, but the most common is a variety of carcinoma known as the columnar or adenoid. It occurs either as a fungating, more or less distinct tumor projecting into the lumen of the bowel; or as a laminar, nodular, or ring-like infiltration of its coats. In either case it is at first covered by apparently unaltered mucous membrane, which, however, is sooner or later destroyed by ulceration, leaving an ulcer with an uneven, proliferating, or excavated surface, everted edges, and an indurated base. As the disease extends, it involves the muscular coat, and subsequently the surrounding structures and organs, gluing them, as it were, to the rectum, and finally converting the whole into a cancerous mass. The lymphatic glands in the pelvis, and later the inguinal glands and others more removed, become affected, and the carcinoma may finally be disseminated, secondary growths being more especially met with in the liver.

The symptoms are often very insidious. At first there may be merely some uneasiness, hardly amounting to pain, about the anus; then more or less pain on defecation is noticed; the feces may be streaked with mucus or with blood, and a slimy discharge may be present. Later, the motions become small, flattened, or pipe-like when the stricture is near the anus, or scybalous when some distance above. The patient strains at stool, and feels as if his bowel had not been emptied; then there is constipation, alternating with diarrhea, and an offensive sanious discharge. Emaciation and cachexia now come on, with more local pain, and the patient dies of exhaustion, peritonitis, or during an attack of acute obstruction.

The diagnosis can only be arrived at by a local examination. The anus generally appears healthy, though probably patulous, and a healthy strip of mucous membrane generally exists between the anus and the growth. When the growth can be felt, its indurated base, and when ulceration has occurred, the everted edges of the ulcer, and the sanious and foul discharge, render the diagnosis generally easy. When beyond the reach of the finger, it may at times be brought down by the patient straining. The fungating form may be mistaken for a villous growth; the annular, for a simple fibrous stricture. A *villous growth* may be distinguished by its velvety and supple feel, by the fact that it does not ulcerate nor break down, by the absence of induration, by the thin and mucoid discharge, by the brightness and scarcity of the blood, by the unattached rectum, and by the duration of the disease. A *fibrous stricture* may be known by its longer duration, by being less indurated than the cancerous form, by the bowel not being fixed, and, when due to syphilis, by the absence of a healthy strip of mucous membrane between the growth and the anus.

Treatment.—If the disease is seen sufficiently early, and before it has involved the surrounding parts, if it is not situated too high up in the rectum, and if the general condition of the patient is otherwise favorable, excision of the growth with the lower end of the rectum should be undertaken, as in this way the whole may be removed, and not without reasonable hope, in some of the less malignant forms of the disease, of its not returning. Some cases have been reported in which it has not done so for upward of 4 years. Previous to removal of the rectum it may be wise to perform inguinal colotomy, since after this operation there is less risk of the wound left by the excision becoming septic. When removal seems impracticable, or otherwise inadvisable, such palliative measures should be adopted as may render the last few months or years of the patient's life as comfortable as possible. Thus, the bowels should be kept gently relaxed, the diet regulated, and the pain relieved by morphin suppositories. In this way the patient can often follow his occupation in comparative comfort and with little inconvenience. Should, however, there be very frequent calls to defecate, much pain and irritation on the passage of feces, or obstruction threaten or have already occurred, colotomy should be performed. This operation should not, as is too frequently the case, be regarded merely as a last resource, to be undertaken when obstruction has come on, as then the danger of the operation is greatly increased. Nor should it be undertaken in every instance, since the inconvenience caused by the cancer is not always sufficient to justify the patient undergoing the risk (Walsham).

Excision of the rectum may be performed if the finger can be passed beyond the growth, if the growth is movable, if the glands are not involved, and if the patient is otherwise fairly healthy. The patient having been placed in the lithotomy position, and a staff introduced into the bladder, a curved bistoury should be passed along the finger up the rectum, and its point made to emerge near the coccyx, and the intervening tissues cut through in the middle line. By this incision a free exposure is obtained. Lateral incisions are next made on each side of the anus, meeting in front, and the bowel is rapidly cleared, either with the finger or with the handle of the scalpel, from the tissues of the ischiorectal fossa. The lower part of the rectum is now dissected more carefully from the urethra and prostate, and when it has been sufficiently freed, the ecraseur is placed above the growth, and the rectum removed, care being taken that the cord when tightened is not pulled down below the spot where it is intended to sever the bowel. If preferred, the scissors may be substituted for the ecraseur, the vessels being then tied as they are cut. When the growth does not involve the whole of the bowel, a strip of mucous membrane should, if possible, be left. The wound should be plugged for 24 hours with iodoform gauze if there is much oozing, and the parts subsequently irrigated frequently. More of the rectum may be removed by resection of the coccyx and lower part of the sacrum, the incision extending backward and to the left side (Kraske's operation).

RECTUM, TUMORS. Polypi.—The term polypus has been erroneously applied to almost any outgrowth from the mucous membrane that projects into the cavity of the bowel. A polypus should be pedunculated, but it may be sessile, provided the base is relatively small; and it may be a new growth altogether—adenoma or fibroma—or a mere overgrowth of the normal tissue of the part. Generally, polypi are single, growing within a short distance of the anus, from the dorsal surface of the bowel; but sometimes there are 2 or 3, and in a few instances there have been hundreds. As a rule, their size is not large; the fibrous ones are seldom larger than a walnut, and adenomta in most instances are not so large; but when there are 2 or 3 together, they have been known to block up the interior, and give rise to symptoms of obstruction. The soft polypus is most frequent in children. It is generally the size of a raspberry, bright red in color, smooth or slightly granular on the surface, and bleeds at the least touch. It is composed mainly of tubules lined with columnar epithelium, like Lieberkühn's follicles, held together by a delicate connective tissue, and dilated in places into cysts; sometimes there is a little more fibrous tissue, and occasionally a few unstriped muscular fibers. At first they are sessile, but as they rarely give rise to symptoms until they protrude from the anus, a long and slender pedicle is generally present by the time the diagnosis is made. Fibrous polypi, on the other hand, are rare except in adults. They spring apparently from the submucous layer, and are composed of fibrous tissue, which may be so hard as to creak when divided with a knife. It has been suggested that they are really adenoid polypi, which in course of time have become hardened and condensed by constant irritation. Occasionally, it is almost impossible to distinguish them from internal hemorrhoids.

Beside these, polypoid outgrowths of mucous membrane, hypertrophied from persistent irritation, are often present in cases of fissure just inside the anus.

Symptoms.—These are not definite until the pedicle is long enough to be grasped by the bowel. In children, bleeding from the anus is often the first thing noticed, and in the absence of injury may be regarded as almost conclusive. Sometimes the growth is extruded during defecation, and is caught by the sphincter, giving rise to pain and spasm; and it may even slough off, and undergo spontaneous cure. In adults hemorrhage is not so conspicuous, but there is usually a considerable discharge of mucus, like thin starch or white of egg, not only with the motions but in the intervals. If the polypus comes down, the pain and irritation may be very severe, and it may drag the bowel down with it so as to cause prolapse, or, if it is situated higher up, intussusception.

A protruding polypus can be recognized at once by its appearance. If it is not visible at first, an injection may be given, and the part examined immediately after. When the finger is introduced, it is advisable to pass it up to its full length at once, and search the mucous membrane as it is withdrawn; otherwise a polypus with a slender pedicle may be pushed up in front of it and missed.

Treatment.—Polypi may be removed by torsion and ligation. The former answers very well in children, and if the pedicle is really twisted off, is not followed by hemorrhage; the latter is better if the pedicle is of any size, or if the growth is fibrous. An anesthetic is advisable. If a ligature is used, precautions should be taken to avoid ulceration.

Villous growths, similar to, but rather coarser than, the fimbriated papilloma of the bladder, are occasionally met with in the rectum. Allingham, who has had the widest experience with this condition, describes these growths as forming soft, lobulated, spongy masses, either sessile or with a pedicle formed from the subjacent mucous membrane. In most cases they grow from the posterior wall rather high up, and by far the greater number occur in people over 50 years of age. In some they cause severe hemorrhage, and the growth occasionally becomes prolapsed; but the most striking feature is the constant discharge of large quantities of thin watery mucus. The diagnosis, unless some portion of the growth is forced out through the anus, is exceedingly difficult, owing to the peculiarly soft, velvety feel of the mass, which prevents distinguishing it from the natural folds of the mucous membrane. The only treatment is free excision; and this is especially necessary, as in a large proportion of cases malignant disease follows (Moullin).

Nevus of the rectum is occasionally met with, and may give rise to very profuse hemorrhage.

Hemorrhoids.—See HEMORRHOIDS.

REFLEXES.—Reflex movement is caused by the stimulus of an afferent nerve, and the transference or return, by a center, of the impulse through an efferent nerve, resulting in movement or function of a peripheral organ. Reflexes may be motor, sensory, secretory, tactile, or inhibitory. See NERVOUS DISEASES (Examination). A table of reflexes is herewith appended.

REFLEXES, TABLE OF.

NAME.	DEEP OR SUPERFICIAL.	HOW OBTAINED.	EFFECT PRODUCED.	SIGNIFICANCE.
Abdominal........	Superficial.........	Sharp, sudden stroking of abdominal wall from margin of ribs downward.	Contraction of muscles about umbilicus.	Shows integrity of cord from eighth to twelfth dorsal nerve.
Ankle-clonus......	Deep.............	By sudden complete flexion of foot, by pressing hand against sole.	Clonic contractions of tendo Achillis, dependent upon alternate contraction and relaxation of anterior tibial and calf muscles.	As in knee-jerk.
Argyll Robertson...	....	See Robertson, Argyll.		
Babinski..........	Deep.............	Irritation of the skin of the sole of the foot.	Extension instead of flexion of the toes.	Lesion of pyramidal tract. Found in organic, but not hysteric, hemiplegia.
Biceps............	Deep.............	Tapping tendon of biceps.	Contraction of biceps muscle.	Same cases as increased knee-jerk.
Ciliospinal	Superficial.........	By irritation of the skin of the neck.	Pupillary dilatation.	
Conjunctival (corneal).	Superficial.........	Irritation of conjunctiva..	Contraction of orbicularis palpebrarum.	Abolished by complete anesthesia, deep stupor coma.
Cremasteric.......	Superficial.........	Stimulation of skin on front and inner aspect of thigh.	Retraction of testicle on same side.	Shows integrity of cord between the first and second lumbar pairs of nerves.
Crossed..........	Deep.............	Stimulation of one side of body.	Reflex on opposite side of body.	
Deep............	....	Reflexes developed by percussion of tendons or bones.		
Dorsal............	Superficial.........	Same as *Erector spinæ.*		
Elbow-jerk.				
Epigastric........	Superficial.........	Stimulation of skin in fifth or sixth intercostal space near axilla.	Dimpling in the epigastrium, due to contraction of the highest fibers of the rectus abdominis muscle.	Shows integrity of cord from fourth to seventh dorsal nerves.
Erector spinæ.....	Superficial.........	Stimulation of skin along border of erector spinæ muscle.	Local contraction of these muscles.	Integrity of dorsal region of cord.

REFLEXES, TABLE OF.

NAME.	DEEP OR SUPERFICIAL.	HOW OBTAINED.	EFFECT PRODUCED.	SIGNIFICANCE.
Front-tap.........	See *Tendo Achillis*.			
Gluteal...........	Superficial.........	Firm sudden stroking of skin over buttock.	Contraction of glutei......	Shows integrity of cord at fourth and fifth lumbar nerves.
Interscapular......	Superficial.........	See *Scapular*.		
Iris-contraction....	Superficial.........	See *Pupillary*.		
Jaw-jerk, or jaw-clonus.	Superficial.........	Downward stroke with a hammer on the lower jaw hanging passively or gently supported by the hand.	Clonic movements of inferior maxilla.	Rarely present in health.
Knee-jerk.........	Deep.............	By striking patellar tendon after rendering it tense by flexing the knee at right angle.	Contraction of quadriceps muscle, foot jerked forward.	Normal in health. *Absent* in locomotor ataxia, destructive lesions of lower part of cord, alcoholic paraplegia, affections of the anterior gray cornua, infantile paralysis, meningitis, diphtheritic paralysis, atrophic palsy, pseudohypertrophic muscular paralysis, diabetes, etc. *Increased* in diseases of the pyramidal tracts, in spinal irritability, tumors of brain, cerebrospinal sclerosis, lateral sclerosis, after epileptic seizures or unilateral convulsions.
Laryngeal.	Superficial.........	Irritation of fauces, larynx, etc.	Cough..................	
Lumbar..........	Superficial.........	Same as *Erector spinæ*....	....	
Nasal............	Superficial.........	Irritation of Schneiderian membrane.	Sneezing................	
Obliquus..........	Superficial.........	Irritation of skin below Poupart's ligament.	Contraction of fibers of external oblique in females; corresponds to cremasteric in males, although it can also be caused in males.	
Ophthalmic (supraorbital).	Superficial.........	Blow struck over supraorbital nerve.	Slight contraction of orbicularis palpebrarum muscle.	
Palatal...........	Superficial.........	Irritation................	Swallowing.	
Palmar...........	Superficial.........	Tickling of palm.........	Contraction of digital flexors.	Shows that cervical region of cord is normal.
Patellar..........	Deep.............	Same as *Knee-jerk*.		
Patellar, Paradoxic	Superficial.........	Percussing patellar tendon with the patient in the dorsal decubitus.	Contraction of the adductor, but not of the quadriceps muscle. If the patient be in the sitting posture the normal reflex is elicited.	Spinal concussion.
Penis-percussion...	Superficial.........	See *Virile*.		
Periosteal.........	Deep.............	Tapping the bones of the forearm or leg.	Sharp contractions of the muscles.	Indicates disease of the spinal cord (amyotrophic lateral sclerosis).
Peroneal..........	Superficial.........	Stroke on peroneal muscles when tense or when the foot is turned inward.	Reflex movements.	

REFLEXES, TABLE OF.

Name.	Deep or Superficial.	How Obtained.	Effect Produced.	Significance.
Pharyngeal	Superficial	Irritation	Swallowing.	
Plantar	Superficial	Stroking sole of foot	Contraction of toes	Muscular exertion.
Platysma	Superficial	Pinching the platysma myoides muscle.	Dilatation of pupil.	
Pupillary		Exposure of retina to light.	Contraction of iris	Absent in basal meningitis, etc.
Paradoxic Pupillary.		Stimulation of retina by light.	Dilatation of pupil	In rare abnormal states.
Paradoxic Patellar.	See *Patellar, Paradoxic.*			
Reinforced	Any reflex is heightened by coincident muscular exertion of other parts than those being tested or by mental distraction.			
Robertson, Argyll.		Light and accommodation.	Pupil reacts in accommodation, but not to light.	Locomotor ataxia.
Scapular	Superficial	Irritation of interscapular region.	Contraction of scapular muscles.	Shows integrity of cord between upper two or three dorsal and lower two or three cervical nerves.
Skin	Superficial	See *Platysma.*		
Sole		Same as *Plantar.*		
Spinal		Those reflex actions emanating from centers in the spinal cord.		
Superficial		Such as are developed from irritation of the skin.		
Tendo Achillis, or front tap contraction	Superficial	By striking muscles on anterior part of leg, while in extension, the foot being extended by the hand upon the sole.	Reflex contraction of gastrocnemius.	Considered by Gowers as a delicate test of heightened spinal irritability.
Toe (great)	Superficial	Strong flexion of great toe.	Involuntary flexion of foot, then flexion of leg, and, lastly, flexion of the thigh on the pelvis.	Met with in cases in which the knee-jerk and other tendon-reflexes are strongly developed.
Virile	Superficial	Sharp percussion of back of penis, the sheath having been made tense.	Retraction of bulbocavernous portion.	Occurs in health.
Wrist-clonus	Deep	By pressing hand backward, causing extreme extension.	A series of jerking movements of the hand.	In the late rigidity of hemiplegia.

REFRACTION OF THE EYE.—The case of **test-lenses** should contain a set of + spheric lenses and − spheric lenses in pairs from 0.12 D. to 20 D.; a set of + cylinders and − cylinders from 0.12 to at least 6 D., and a set of prisms from 0.5 degree to at least 20 degrees; several plain-colored glasses, opaque glasses, blanks, stenopaic discs, etc., and a trial-frame.

Trial-frames for test-lenses are of several varieties. The most common form consists of an arrangement whereby the nose-piece may be rapidly adjusted by means of a screw, so as to make the frame conform to any height or depth of the bridge of the patient's nose. A vertical and horizontal adjustment by a rack-and-pinion movement on the nose-piece enables us to quickly and perfectly adjust the frame to any peculiarity of the patient's face. A millimetric scale with a pointer moved by a double rack-and-pinion device gives the distance between the pupils at a glance. The lens-holder consists of two hollow grooves, with a slot in each eye-piece to permit rotation of cylindric lenses with handles. On the outside of each eye-piece are hooks for adjusting an additional lens or a blinder. The markings on the eye-pieces begin at zero at the nasal side, and run to the temporal side to 180 degrees. The axis at which the cylinder is inclined is found by comparing the axis marked on the test-cylinder with the coinciding number on the trial-frame. However, as the trial-frame is not often perfectly adjusted, it is well for the surgeon to learn to estimate the angle, particularly in the vertical and horizontal meridians, with his eye. In placing strong lenses in the trial-frame it is well to have the convex surface of convex lenses turned away from the eye, and the concave surfaces of concave lenses turned toward the eye. In all cases the lenses should be placed as near the eye as possible.

Practical Procedure with the Test-lenses.—Having been assured that all the accommodation is suspended, seat the patient to the left of the table containing the test-lenses, and commence the examination with the right eye, covering the left with an opaque lens or metal disc. Then ask the patient to read down the card situated at 5 or 6 meters' distance, until he comes to the letters that are indistinct; then commence the application of the lenses. Experience will give a good idea what lens to start with, by noting the amount of interference with vision after mydriasis. If the patient is able to recognize only the largest letters on the card, he is either amblyopic, myopic, or highly hyperopic, and is quite likely in every case astigmatic. If the patient is amblyopic from intraocular disease or other cause, the application of a pin-hole perforated disc will not increase his vision, and it is not likely that glasses will improve his sight. If the trouble is only refractive, he will at once notice an improvement in vision through the small perforation. If he is astigmatic, he will select the stenopaic disc (a blank disc with a small open slit, described under Astigmatism (q. *v.*)) at an angle corresponding to the axis of his astigmatism, and the two meridians may be refracted separately by spheric lenses alone.

It is perhaps well to assume the simplest examination of a moderate degree of ametropia. First using a low power + spheric lens (0.25), inquire if the confused letters are improved by it; if the patient answers yes, try a corresponding strength astigmatic lens starting at axis 90 degrees, and inquire if the vision is still better; then rotate the cylinder in the frame, finding the axis at which the letters are seen best. If the patient prefers the cylinder to the spheric lens, put on the cylinder at the axis preferred, and determine the line read with this correction. A low power + spheric lens (0.25) is held in front of the eye that is already corrected by a cylinder, and inquiry is made whether or not the vision is improved, and also whether a correspondingly low + cylinder still further improves the vision; if the spheric lens is preferred to the cylinder, it is put in the trial-frame, back of the cylinder first applied, and the same mode of procedure further pursued, testing with a low spheric lens and then a low cylinder until the vision can no longer be improved. The result is then noted and the examination of the other eye commenced in the same manner.

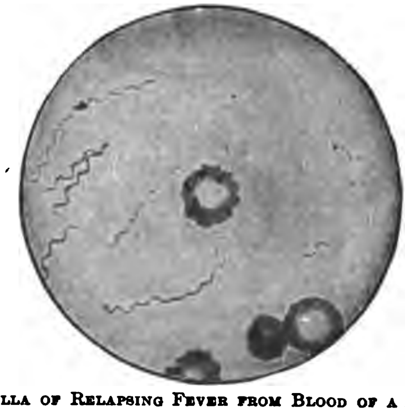
If, however, neither a + spheric nor a + cylinder lens improves the vision, a − spheric and a − cylinder are used in the preceding manner. It sometimes happens that a + cylinder is accepted, but further improvement cannot be obtained by an advance in the strength of a cylinder, or by the addition of a + spheric lens; in such case immediately resort to a − spheric lens or a − cylinder, placed at an axis at right angles to the position at which the + cylinder was preferred. Occasionally rotating a cylindric lens of one eye, with both eyes corrected and participating in vision, will definitely determine a doubtful axis better than if the fellow-eye is excluded by an opaque disc.

An exact knowledge of the correct method of using the test-lenses can only be obtained by long experience; a few other practical points are given in the discussion of the various forms of ametropia. See Astigmatism, Hyperopia, Myopia Eyestrain.

Other Methods of Determining Refraction of the Eye.—In this discussion the many other ingenious methods devised will be left to the numerous textbooks on ophthalmology. For practical purposes it is only necessary to describe the ordinary and universally used subjective method with test-cards and test-lenses, and the objective methods of importance—namely, refraction with the retinoscope, with the ophthalmoscope, and the estimation of corneal astigmatism by the ophthalmometer. See Ophthalmometer, Ophthalmoscopy, Retinoscopy, Vision (Tests).

RELAPSING FEVER (Febris Recurrens; Spirillum Fever; Famine Fever; Seven-day Fever; Typhus Icterodes).—An acute infectious disease characterized by two or more febrile relapses separated by periods of total remission, and caused by the inoculation and multiplication of the spirochete of Obermeier.

Etiology.—The specific cause of relapsing fever is the spirochæta Obermeieri formerly regarded as a bacterium of the genus spirocheta but now regarded as probably a protozoan parasite—a trypanosome. First discovered by Obermeier in the blood of cases, it is known by his name. It is a narrow spiral about 0.025 to 0.05 mm. (1/1000 to 1/500 inch) in length; that is, its length is from 3 to 6 times the width of a red blood-disc. It is found floating among the blood-discs during the fever. Before the crisis and in the intervals the organism is not found; but small, glistening spherules, said to be its spores, take its place. Confirmation of the contagious nature of the disease is found in the fact that it has been communicated from one human being to another by inoculation of blood, and to monkeys in the same way. It may be supposed that the organism is given off in the breath or from the skin. The operation of the cause is undoubtedly favored by overcrowding,



Spirilla of Relapsing Fever from Blood of a Man.—(*Kolle and Wassermann.*)

by filth, and by destitution. Yet the disease is not confined to the poorly fed. Neither age, sex, nationality, nor season are factors in its causation.

There is no essential morbid anatomy, and such as is found corresponds with that of typhus. Most conspicuous is enlargement of the spleen.

Symptoms.—The period of incubation varies greatly, so that it is put down at from 2 to 14 days. According to Murchison there may actually be no interval between exposure and the invasion. The latter is sudden by a chill, fever, intense pain in the back and limbs, with dizziness. This abrupt invasion is a distinctive feature, and in perhaps none of the contagious diseases is it as a rule so marked. Exceptionally only is there a short period of malaise with loss of appetite. On invasion the temperature rises rapidly and quickly reaches 104°F. The patient cannot retain his feet and promptly takes to his bed, feeling very sick rather than profoundly weak; there may be nausea and vomiting and even convulsions in the young; the pulse rises rapidly, more rapidly than in typhus, reaching 140 on the second day, and later 150 and 160. The patient may be delirious, but the typhoid symptoms are not usually so profound as in typhus, and the tongue remains moist. Jaundice appears in a certain number of cases on the third or fourth day, usually in 1 out of every 12 cases, occasionally as often as 1 in every 4 or 5. The temperature during the paroxysm fluctuates slightly, being higher in the evening. Sweating and sudamina are often present and occasionally petechiæ, but there is no characteristic eruption. Rarely, a roseolous rash appears in small spots, or it may be a mottling like that of typhus, which, however, always disappears on pressure, and disappears altogether in 3 or 4 days, differing in these respects from the similar eruption of typhus. Herpes may be present. There is occasionally abdominal tenderness in the epigastric or iliac region and the enlarged spleen may be easily detected, but there are no active intestinal symptoms. The liver is also slightly enlarged, extending lower than in health. The spirillum is to be found in the blood and should always be looked for. It may readily be detected with a power of 500 diameters without any special preparation of the blood, care being taken simply to secure a thin film.

If the invasion of relapsing fever is sudden, its termination is not less so. It is by crisis, beginning usually with sweating. After 5 or 6 days of unabated fever, sweating sets in, which soon becomes profuse, the temperature falls rapidly to normal or even subnormal, the various discomforts fade away, and in the course of a few hours the patient is apparently well. Rarely the crisis may be ushered in by a diarrhea, an epistaxis, or the appearance of menstruation. The crisis does not always take place at the same stage of the disease. It may occur as early as the third day or not until the tenth, and even the fifteenth, but most commonly on the seventh. While the crisis is ordinarily followed by some relaxation and faintness, there soon ensues a rapid recovery of natural and healthful feeling. Occasionally, however, the depression is greater, and a feeling as of collapse occurs, especially in delicate or elderly persons. Again, in a week from the crisis—generally on the fourteenth day from the primary chill—another occurs, or a series of them, with fever, and the paroxysm repeats itself, to be again succeeded by a crisis at a somewhat shorter interval. There may be a third or even fourth and fifth paroxysm; more commonly they are limited to two or at most three. Each succeeding attack is shorter than the previous one. Occasionally there is no relapse, the disease terminating with the first crisis. Convalescence, usually rapid, is sometimes prolonged, and the duration of the entire illness may be put down at from 18 to 90 days, and the patient rarely returns to work within 6 weeks. One attack does not confer immunity from another (Tyson).

Complications.—Among the complications may be mentioned bronchitis, pneumonia, nephritis, and hematuria. The spleen may enlarge until it ruptures. It may attain a weight of 4 1/2 pounds, and may be the seat of infarcts. Albuminuria occurs as in other fevers characterised by high temperatures. Pregnant women usually abort in the relapse, and the child, if not still-born, survives but a few hours. Postfebrile paralysis may occur, and troublesome ophthalmia succeeds in some epidemics.

Diagnosis.—**Yellow fever** has many points of resemblance, but has a shorter febrile stage, remission not so complete, vomiting late and characteristic, normal spleen, and the late appearance of yellow color.

Remittent fever begins with a decided chill, followed by fever and sweats, and not the progressive rise of temperature until the fifth or seventh day. Examination of the blood will reveal a different organism from that of relapsing fever.

Prognosis.—Recovery is the rule, but protracted, and decided emaciation results.

Treatment.—The febrile paroxysm demands much the same treatment as typhus: Careful nursing; sponging or cool bathing; nutritious, easily assimilable food, and stimulation, although the latter is less important than in typhus. No drug has the power to prevent the recurrence of the relapse, although quinin is indicated, and, as in other adynamic fevers, is useful as a roborant. It is reasonable to expect that acetphenetidin, acetanilid, or antipyrin will relieve the muscular pains. Should they not suffice, morphin, hypodermically, can be relied upon. A serum has been elaborated from the blood of infected horses and the results following its use seem gratifying.

REMITTENT FEVER.—See MALARIAL FEVERS.

RENAL CALCULUS.—See KIDNEY (Stone).

RESINOL.—A product obtained by the destructive distillation of resin. It occurs as a yellowish oily liquid, and is used as a solvent for phenol, aristol, iodol, camphor, cocain, carbolic acid, creosote, phosphorus, and many alkaloids. Its physiologic action and uses are those of tar. In chronic scaly skin-diseases, especially psoriasis and chronic eczema, it is serviceable.

RESINS (Resinæ).—The proximate principles called by this name are neither the commercial resins nor the resins of pharmacy, all of which are complex bodies, but include only the chemical individuals of resinous character existing in nature, as those in copaiba, cannabis, gamboge, guaiac, gurjun, etc. Even these, in their commercial form, are accompanied by other principles. It is difficult to define the resins correctly, but they are generally considered to be oxidation products of hydrocarbons, such as terpenes. They are mostly brittle, amorphous, uncrystallizable solids, insoluble in water, but soluble in alcohol, ether, chloroform, benzin, etc. Most of them are of acid character, combining with alkalies to form a kind of soap, these "resin-soaps" being soluble in water and giving up their resins again to the action of acids. They soften or melt when heated and solidify again on cooling.

The substances ordinarily called resins are usually classified as follows:

True resins are hard, compact products of oxidation, and are made up chiefly of resin acids. Such are copal, damar, mastic, sandarach, dragon's blood, gum-lac and amber. **Gum-resins** are natural mixtures of gum and resin. When they are rubbed up with water the gummy matter dissolves and the resin is suspended in the form of an emulsion. Such are olibanum (frankincense), myrrh, ammoniac, asafetida, galbanum and tragacanth. **Oleo-resins** include all mixtures of volatile oils and resins of whatever consistency, also the balsams or mixtures of resins with benzoic and cinnamic acids. Such are copaiba, crude turpentine, storax, and the true balsams—benzoin, balsam of Peru and balsam of Tolu. See OLEO-RESINS. **Pharmaceutical resins** are solid preparations obtained by precipitating the resinous principles of plants from their alcoholic solutions by the agency of water. They differ from alcoholic extracts in containing only those principles which are soluble in alcohol and insoluble in water, while the extracts contain all principles which are soluble in alcohol. Including resina itself, which is the residue left after distilling off the volatile oil from turpentine, there are 4 official resins: Resina; R. Jalapæ; R. Podophylli; R. Scammonii.

RESORCINOL.—$C_6H_4(OH)_2$. Metadioxybenzene, a substance produced from different resins, and from umbelliferous gum-resins on fusion with caustic potash. It is isomeric with hydroquinon. It crystallizes in colorless rhombic prisms or plates, melts at 118° C., and boils at 276° C. It resembles carbolic acid in many of its properties, but it is less toxic; it is odorless, antiseptic, and a powerful germicide. It is valuable chiefly as an antipyretic in malarial fevers, and locally as a lotion in diphtheria and certain skin-diseases. Dose, 1 to 10 grains; as an antipyretic, 5 grains every 2 hours, or 15 to 30 grains not repeated. It is readily soluble in water, alcohol, and ether. In dyeing it yields a fine purple-red coloring-matter, and several other dyes of commercial importance.

Poisoning.—Toxic doses (15 grains to each 35 ounces of weight) paralyze the motor tracts in the spinal cord, but do not affect the general sensibility. It is eliminated chiefly by the urine, which it colors a bluish-violet hue. The best test of its presence is the solution of the perchlorid of iron, which produces with it a dark-violet, almost black, color. Atropin and other cardiac and respiratory stimulants, cerebral excitants, and agents that raise the arterial tension are physiologically antagonistic.

In subacute or chronic eczema:

℞. Resorcin, } each, ʒ j
Zinc oxid, }
Cold cream, ʒ x.

Apply to the affected parts twice daily.

RESPIRATION.—See ARTIFICIAL RESPIRATION, CHEST (Examination).

REST CURE.—What is known as the "rest cure" or "rest treatment" was perfected in this country by S. Weir Mitchell. The treatment is especially directed toward the restoration of the vitality of the feeble or overworked by a combination of isolation from friends, rest in bed, and excessive or forced feeding, together with the thorough use of massage and electricity. The cases best suited for this treatment are those in which an enfeebled condition has resulted from an infectious disease, from pneumonia, etc., those of chronic dyspepsia, malarial toxemia, neurasthenia, spinal irritation, and hysterics.

By this method an entire change in surroundings, diet, and mode of life is instituted with the hope that "routine" may be combated and mental activity reduced to the minimum. From 4 to 6 weeks absolute rest in bed is required in most cases.

During the first week only milk is allowed, 4 ounces of which are given every 2 hours and gradually increased until 10 to 12 ounces are given every 3 hours. Stimulating drugs are prohibited, the dominant idea being to place the whole nervous system in a state of profound rest. Nutritive tonics and digestants only are permitted.

To counteract depression and exhaustion, which necessarily ensues from confinement to bed, massage and electricity are employed daily. Proper periods are chosen for massage, usually selecting some period an hour or two after meals. The patient lying in bed, the operator, first beginning at the toes, carefully kneads the parts in all directions; the muscles of the foot are then similarly treated, then the ankles, legs, and body, while at the same time the joints are bent in all directions.

It is essential that the anatomic relations of the muscles should be known in order that passive exercise of each may be encouraged. From 20 minutes to 1 hour are spent in this exercise. In treating the larger muscles they should be grasped firmly, pressed downward, and then kneaded. All massage movements should be in the direction of the heart, in order that the circulation may be naturally stimulated. The form of electricity employed is the faradic current of very moderate intensity with a slow interrupter. A space of 4 or 5 inches should interpose between the two poles, and sufficient time allowed to elapse in order that a full muscular contraction may ensue. After the arms and legs have been treated in this manner for some time, the rapid interrupter is used; one pole is applied to the neck, the other to the heel for 10 minutes, then to the other heel for an equal length of time. Forty minutes should be given to this application.

Proper mental and bodily habits are demanded. The patient is aroused about 7 A. M., given a cup of coffee, tea, or cocoa, and subsequently a cold bath while in bed, bathing each limb alternately; an hour later a generous breakfast is allowed, and at 10.30 milk, broth, or soup is given. At 11 A. M. massage is employed, followed by a glass of milk. At 1 P. M. a liberal dinner is given, and at 3 P. M. liquid food. At 6 P. M. a moderate supper is served, and at 9 P. M. a glass of milk. Frequently, a dry scrub-bath may be given before the patient is allowed to sleep.

In 3 or 4 weeks the patient may be allowed to sit up out of bed for an hour or two, and a few days later may take excursions out of doors for from a half or three-quarters of an hour. At the end of 6 weeks the patient is advised to spend several months at the seashore, and, if possible, a short period in the mountains.

RETENTION OF URINE.—See URINE (Retention).

RETINA, DISEASES.—**Hyperemia** of the retina is detected by an increase in the size of the retinal vessels, particularly noticeable over the disc, which appears pinkish in contrast. It is caused by stasis or irritation. In stasis-hyperemia the thickness of the veins in comparison with the arteries is noticed. Irritation-hyperemia usually accompanies inflammation of some other portion of the eye, or it may be a sign of eye-strain. It is quite common in persons with some uncorrected refractive error or muscular imbalance, who use their eyes to excess.

Treatment should be directed to correction of any ametropia or muscular trouble, and the eye should be put at rest and shielded with protective glasses. If the hyperemia is supposed to be a local expression of cerebral congestion, the treatment for the latter affection should be instituted.

Retinal hemorrhage is seldom an independent affection, but is usually associated with some disease or injury of the retina; or it may be the result of some condition provocative of hemorrhage in any other organ, such as atheroma of the arteries, hypertrophy of the left ventricle, scorbutus, hemorrhagic purpura, nephritis, diabetes, pernicious anemia, etc. In such conditions the immediate cause may be muscular strain, violent coughing, or sudden change in the intraocular tension after operation. Hemorrhage following occlusion of the retinal vessels will be mentioned later.

Diagnosis with the ophthalmoscope is easy if the media are clear and if the remaining portion of the retina and disc is unaffected. In such a case a fresh clot appears as a bluish-red blotch on a white background; or, if the clot is old, a brownish-red blotch is seen; or the only remnants of the hemorrhage may be a spot of yellowish-white degeneration, perhaps associated with pigment deposits. The hemorrhage is flame-shaped when in the internal layers, rounded when in the external layers, and massive when between the retina and hyaloid membrane of the vitreous (subhyaloid). If other blotches are seen in the retina and the whole fungus is hazy, the condition is called hemorrhagic retinitis.

Prognosis depends on the cause and recurrence of hemorrhages; unfortunately, the prognosis of affections causing retinal hemorrhage is usually bad. The amount of visual disturbance depends on the location and size of the clot. Hemorrhage in the macula is serious. Multiple hemorrhages may cause a glaucomatous condition, producing blindness.

Treatment must be directed to the general causative condition. Patients should be put to bed and the eyes bandaged. Congestion may be relieved by leeches or dry cups to the temples. Mercurials and iodids, together with diaphoresis, may promote absorption.

Retinitis.—It is probable that idiopathic retinitis never occurs. Inflammation of the retina is generally due to some disease of the general system, such as syphilis, renal disease, diabetes, leukemia, etc. In cases of prolonged exposure or excessive use of the retina the resultant affection is more in the nature of a functional trouble than a true inflammation. Retinitis may be due to an extension of inflammation from the neighboring structures, principally the ciliary body, choroid, and optic nerve. Panophthalmitis produces an immediate suppuration of the retina.

The subjective symptoms of retinitis are usually dimness of vision, scotoma, metamorphopsia, etc. **The objective symptoms** elicited by the ophthalmoscope are sometimes quite characteristic of the causal trouble, although differential diagnosis is at times very difficult. However, the condition discovered is often a valuable indicator in substantiating systemic evidence of the general disease, and is an important factor in prognosis.

Albuminuric retinitis is almost always bilateral, although a number of unilateral cases are recorded. The light-sense, color-sense, and visual field are usually undisturbed. Dimness of vision progresses slowly, and sometimes it is difficult for the patients to count fingers. This affection often accompanies the nephritis of pregnancy. Uremia, coincident with renal disease, may cause complete blindness, but this cannot be attributed to retinitis, but rather to a transient effect upon the cuneus lobe by the uremic poison.

Ophthalmoscopic changes differ in the various stages, although they are most marked in advanced renal disease. The changes in the fundus are generally confined to the posterior pole and region adjoining. Hyperemia is at first noticed, but in the advanced disease white spots or patches are seen about the papilla, and later fine white dots are noticed grouped about the macula in the shape of a star with the fovea in the center. Finally, hemorrhages and fatty degeneration, with paleness of the disc and contraction of the vessels, may occur just before death. In some cases, instead of white spots, there may be numerous widespread hemorrhages, or, again, only congestion and simple redness of the disc.

Prognosis.—The exact relation between retinitis and the coincident renal disease is not definitely established. However, it may usually be said that a definite case of albuminuric retinitis will have a fatal issue within 2 or 3 years, although the visual disturbance may not increase, and may even improve in fatal, chronic cases. Cases have been observed in which the patients have lived from 5 to 10 years after typical albuminuric retinitis had been established. In interstitial nephritis particularly, retinitis is a serious sign. After recovery from acute nephritis an associate retinitis may clear up and the vision become normal. The prognosis of both life and vision is better in the albuminuric retinitis of pregnancy, and in cases in which only one eye becomes involved.

Treatment must be that of the original disease. In hemorrhagic cases, rest, bandaging of the eyes, and possibly the instillation of atropin, in weak solution (1 grain to 1 ounce), are advisable. The appearance of albuminuric retinitis in pregnancy is regarded by many as an indication for the induction of abortion. See NEPHRITIS.

Diabetic retinitis is often indistinguishable from albuminuric retinitis by the ophthalmoscope alone. The diagnosis can only be made by the test for glycosuria. The prognosis is probably not so bad as in the foregoing disease, and dietary and hygienic treatment may establish a cure.

Syphilitic retinitis is a diffuse instead of a local inflammation, as in the preceding diseases, and may be unilateral or bilateral. A general cloudiness, most apparent at the optic disc, and gradually shading off into the periphery of the fundus, is noticed. White lines may be observed along the course of the blood-vessels. There are numerous dust-like opacities in the vitreous. Hemorrhages are less frequent than in the preceding forms. The treatment is purely constitutional.

Leukemic retinitis is characterized by the pale-yellow appearance of the fundus, always bilateral. There is a marked tendency toward hemorrhages; sometimes circular white clots and prominent blood-bordered spots are seen at the periphery of the retina. Diagnosis should be substantiated by microscopic examination of the blood. The treatment is that of leukemia.

Retinitis of pernicious anemia presents an edematous condition of the retina, diffuse retinitis, with distended veins and pallid blood. The disc appears dirty greenish-white, against a yellowish eye-ground.

Retinitis Pigmentosa.—A pigmentary degeneration of the retina sometimes found in descendants of consanguineous marriages, or of syphilitic parents. It occurs commonly in members of the same family.

Symptoms and Diagnosis.—The chief subjective symptoms are night-blindness, due to the reduced sensitiveness of the retina; concentric contraction of the field of vision, often coupled with nystagmus, causing the patient great inconvenience from inability to find his way, although his central vision may be acute. The constant bowing of the head in walking is a characteristic sign. The fundus has a very characteristic appearance. The disc is yellowish and its edge is somewhat obscured, and the vessels are narrowed, accompanied by fine bands, and fade off into the periphery. Dark streaks of pigmentation, beginning at the periphery, trail over the fundus, and gradually progress toward the macula. In appearance these have been compared to the Haversian bone-canals. Cases of retinitis pigmentosa without the distinctive pigmentation are occasionally found. There is evidence of pigment-atrophy at the periphery, slightly subnormal night-vision, narrowed color-field, etc.

Treatment is useless. All that can be done is to keep the patient in good health and spirits, and surround him with hygienic conditions conducive to the arrest of any degenerative process.

Thrombosis and Embolism of the Retinal Vessels.—Embolism of the central artery of the retina is rare. Both the ophthalmic and central retinal arteries branch at right angles from their parent stems, and an embolus is easily swept by them. The characteristic subjective symptom is sudden blindness in one eye, probably after some slight exertion. There may be temporary improvement during the succeeding weeks, but the prognosis is very unfavorable. The differential diagnosis between thrombosis and embolism with the ophthalmoscope is sometimes difficult. Hemorrhages are more numerous in thrombosis, and there is intense swelling of the nerve and retina. There is pallor of the disc and retina in embolism, and marked diminution in the size of the vessels. The veins become tortuous and very irregular. The central portion of the retina becomes hazy and grayish, the macula standing out in sharp contrast by its maintenance of the normal red color, the classic "cherry-red spot," supposed to be due to the nonexistence of the nerve-fiber layer at the fovea, allowing the choroidal vessels to show through. Finally, atrophy of the disc and retina ensue, and the vessels become obliterated and replaced by white streaks. Involvement of only a branch of the central artery is followed by an anemic and degenerated sector-like area supplied by the affected artery. The diagnosis should be confirmed by the discovery of some systemic source of embolus or thrombus, such as endocarditis, or other organic heart affection, phlebitis, pyemia, etc.

Treatment is of little avail; but sometimes in very recent cases it may be possible to remove the embolus by massage of the eyeball, or by reduction of the internal tension, as by sclerotomy. General treatment is, of course, indicated.

Detachment of the Retina.—The most common cause is disease of the choroid consequent upon myopia of high degree. Chronic inflammation of the eyeball or of the retina alone, fluid effusions or hemorrhage between the retina and choroid, injuries, new growths, diseases of the vitreous, removal or dislocation of the lens, and parasites, are other causes. Any condition in which the intraocular tension is suddenly lowered—as, for instance, by the rapid escape of vitreous after a corneal section—predisposes to retinal detachment.

Symptoms and Diagnosis.—The premonitory signs are flickerings and the appearance of dazzling sparks before the eyes, and attacks of momentary blindness. The detachment takes place suddenly, and the field of vision is obscured by what seems to be a dark cloud before the eyes. The detachment is only partial at first, and the retina is still nourished by its own vessels, its functions being impaired rather than destroyed. Naturally, the refractive condition of the eyes is more hyperopic, but as the detached portion of the retina constitutes irregular folds, which constantly move with every movement of the eye, metamorphopsia and other anomalous visual disturbances are present. By the ophthalmoscope there is absence of the red reflex in the region of the detachment. In advanced cases a bluish-gray curtain is seen floating freely in the vitreous, and many even be seen by the naked eye. The picture may be confused by vitreous opacities, which frequently accompany this condition.

Prognosis is dependent on the cause. If caused by intraocular tumor, the case may be considered hopeless. If due to pronounced myopia, one eye is usually attacked after the other, and blindness is unavoidable. In the other conditions the progress of the detachment may possibly be arrested, but we can hardly hope for improvement, although instances of alleged reattachment without treatment have been reported.

Treatment consists of prolonged rest in bed with protection of the eyes from light by a pressure-bandage. Antiphlogistic measures should be adopted; diaphoresis with the salicylates, or by hypodermic injection of pilocarpin, may prove of benefit. Several cases are reported to have been cured by a course of tuberculin treatment. See TUBERCULOSIS (Ocular).

The operative treatments that have recently been recommended are puncture through the sclerotic, allowing escape of the subretinal fluid, injection of an artificial vitreous in front of the prolapsed retina, or injection of a few drops of iodin in the vitreous. The real value of these measures is doubtful.

Glioma of the Retina.—A malignant tumor, soft and highly vascular, developing in the retinal connective tissue (sometimes designated neuroglia).

Symptoms.—It occurs chiefly in children from 1 to 4 years old. On account of the youth of the patient and the absence of pain, the early subjective symptom—visual disturbance—escapes unnoticed. The child may be totally blind for some time without the parents' knowledge, attention to the eye first being called by the bright shimmer in the pupil, the so-called "cat's eye." In the first stage of the disease the ophthalmoscopic examination shows a yellowish prominence surrounded by small nodules, toward which dilated retinal vessels converge. In the second stage there is probably increased tension, and the growth begins to push its way forward, carrying the retina, lens, and iris with it. The cornea and the aqueous may become opaque, and the conjunctival vessels intensely congested. Internal inflammation progressively increases, and the tumor may escape through a perforation in the cornea or penetrate the sclera, and appear as a spongy bleeding mass between the lids. The final stage is extension along the optic nerve, or metastasis to the neighboring structures.

Diagnosis is easy after the second stage is reached. In their early stages suppurative choroiditis or hyalitis may produce symptoms so closely resembling glioma that they have been called pseudoglioma. However, in choroiditis inflammation precedes the blindness, and the eye is soft. If there is doubt as to the diagnosis, the case should be treated as glioma, to prevent an error, which may prove fatal.

Prognosis.—Unfortunately, it is usual for the child to be brought for treatment after the disease has progressed sufficiently to cause the "cat's eye" or other prominent objective symptoms, and it may be too late even to save the child's life. There is absolutely no hope of preserving the affected eye.

Treatment.—Not only should the affected eye be immediately enucleated, but the optic nerve should be divided as far back as possible, and if there is the slightest sign of invasion of the orbital tissues, they must be removed and the orbit cauterized.

RETINOSCOPY (Shadow-test).—The method of estimating the refraction of an eye by reflecting into it rays of light from a plane or concave mirror, and observing the movement that the retinal illumination makes by rotating the mirror. To avoid confusion, the description of retinoscopy that follows will apply to the plane mirror, which is to be preferred to the concave mirror, as it is decidedly more satisfactory for general use and convenience.

The principle of retinoscopy is the finding of the point of reversal, or myopic far-point. Should the eye under examination be emmetropic or hyperopic, it must be given an artificial far-point.

Advantages.—Of all the objective methods of refraction, retinoscopy in the hands of the expert is the most exact, but, like all objective methods, its results should, when possible, be confirmed with the trial-lenses.

Retinoscopy offers the following advantages:

1. The character of the refraction is quickly diagnosed.
2. The refraction is estimated without the verbal assistance of the patient.
3. No expensive apparatus is necessarily required.
4. Little time is taken to estimate the refraction.
5. It is of inestimable value in the young, in the feeble-minded, the illiterate, in cases of amblyopia, nystagmus, and aphakia; and in such cases the retinoscopic correction may be ordered.

The retinoscope, or mirror, is of varying form and size. The one recommended is the small plane mirror, 2 cm. in diameter, on a 4 cm. metal disc, with a 2 mm. sight-hole at the center of the mirror, made by removing the silvering and *not by* cutting a hole through the glass.

The light should be steady, clear, and white, and secured to a movable bracket. For general use the Argand burner is best. As only a small portion of the flame is used, it is necessary to cover most of it with a screen.

The screen, or cover-chimney, is made of thin asbestos and of sufficient size to fit easily over the glass chimney of the Argand burner. The opening used, generally 1 cm. in diameter, should be opposite to the brightest part of the flame. An asbestos cover-chimney is used in preference to metal, as it intercepts most of the heat.

The room for retinoscopy must be darkened, and the darker the better; all sources of light except the one in use must be excluded. This must be insisted upon, as darkness offers the best contrast to the test.

Position of the Light and Mirror.—The rays of light coming out of the opening in the light-screen should be 5 or 6 inches in front and to the left of the observer, so that the rays may pass in front of the left eye and fall upon the mirror held before the right eye, thus leaving the observer's left eye in comparative darkness; or this may be reversed if the observer is left-handed. The observer should keep both eyes wide open.

In order to see the movements distinctly the observer should wear his correcting glasses, but need not make any note of his accommodation as in using the ophthalmoscope.

The patient must have his accommodation thoroughly relaxed with a reliable cycloplegic, and be comfortably seated in front of the observer, *preferably at* 1 *meter distance*, with his vision steadily fixed on the observer's forehead just above the mirror; or, even better, the patient may concentrate his vision on the edge of the metal disc of the mirror, but never directly into the mirror, as that would soon irritate and compel him to close his eye. In cases of squint it is particularly necessary to cover one eye while its fellow is being refracted.

To Find the Point of Reversal.—In observing the retinal illumination, the most important thing to study is the direction in which it moves, or whether it moves at all. For example, having determined at 1 meter distance, with a + 2.00 D. lens before the patient's eye, that the retinal illumination moves in the same direction in which the mirror is tilted, and then, substituting a + 2.25 D., and the illumination appears to move in the opposite direction, the observer will know at once that the difference in the strength of these lenses, + 2.12 D., would bring the emergent rays to a focus on his retina and that no movement of the retinal illumination could be made out, and this point, when found, is the point of reversal or artificial far-point.

Emmetropia.—The rays of light from an emmetropic eye proceed parallel, and by reflecting the rays of light into such an eye from a distance of 1 meter the observer sees a small bright retinal illumination, which moves rapidly in the same meridian through which the light is passed. By placing a + 1.00 D. lens in front of such an eye all apparent movement in the pupillary area ceases, showing that the + 1.00 D. has bent the emergent rays and brought them to a focus on the observer's retina. This +1.00 D. has made this emmetropic eye myopic just 1 D., so that in taking the patient thus refracted from the dark room to test his vision at 6 meters, this 1 D. of artificial myopia must be removed, thus proving the emmetropic condition.

Hyperopia.—In hyperopia the same conditions hold true as in emmetropia. For example, having placed a + 3.00 D. in front of the eye and found that the previously slow movement with the mirror has ceased, and substituting a + 3.25 D. makes it move opposite, it will be known at once that the + 3.00 D. was the correcting glass for 1 meter; or, in other words, that the original divergent rays proceeding from the eye were bent by the + 3.00 D. and brought to a focus on the observer's retina. Two D. of this + 3.00 D. would have made the eye emmetropic, but the additional + 1.00 D. made the eye myopic just that amount, and taking the patient from the dark room this 1.00 D. of artificial myopia must be taken from the dark-room result, which would leave + 2.00 D. as the amount of the hyperopia.

Myopia.—The rays of light from a myopic eye always proceed convergently, and to the observer seated at 1 meter distance the retinal illumination appears to move opposite to the direction in which the mirror is moved *if* the myopia exceeds 1 D., and to move *with* the movement of the mirror if the myopia is *less* than 1 D. An eye that is myopic just 1 D. has its emergent rays focusing at 1 meter, and the observer with his eye at this point does not recognize any apparent movement in the pupillary area.

For example, an eye that is myopic 4.00 D. has its emergent rays focusing at 10 inches. and the observer at 1 meter has the apparent movement of the retinal illumination moving opposite to the movement of the mirror. If a − 3.00 D. is placed in front of this eye, the emergent rays then focus at 1 meter, at which point the observer does not appreciate any movement of the retinal illumination. It will thus be seen that the eye that is myopic more than 1.00 D. retains 1 D. of its myopia when tested at 1 meter, and this 1.00 D. must be supplied in taking the patient from the dark room to test his distant vision.

If the observer will remember to always use a plus lens when the retinal illumination moves with the movement of the mirror, and a minus lens when it moves opposite, and allow for the 1. D. of myopia **when working at 1 meter,** he will have the following rule to guide him: namely, **to add a minus 1.00 D. to the dark-room result in every instance—*i. e.*,**

Dark room	0.00 D.	+0.25 D.	+0.50 D.	+0.75 D.	+1.00D.
add	−1.00	−1.00	−1.00	−1.00	−1.00
Result	−1.00	−0.75	−0.50	−0.25	−0.00

Regular Astigmatism.—The presence of this condition when looking in the eye before any neutralizing lens has been placed in position, can be determined when a band of light is seen extending across the pupil, or when it is possible to note a difference in the rate of movement of the retinal illuminations of any two meridans at right angles to each other. If the spheric error is high and the cylinder a low one, then it will not always be possible to recognize the characteristic band of light (astigmatism) until the approximate neutralizing sphere has been added.

The axis subtended by the band of light after the requisite sphere has corrected the meridian of least ametropia is the axis for the cylinder in the prescription to be given.

The better way to neutralize cases of astigmatism is to use spheric lenses in preference to cylinders, for by so doing the difficulty of placing cylinders on the exact axis is avoided; for example, in the following formula, +S. 2.00+C. 1.00 axis 90 degrees, it will be found that a + 3.00 sphere in the dark room will correct the 90 degrees meridian and partly correct the 180 degrees meridian; and that a + 4.00 sphere will correct the 180 degrees and overcorrect the 90 degrees meridian, making a difference in the strength of the two spheres employed of 1.00 D., which is the amount of the cylinder required. After thus obtaining the result, the observer may, if so disposed, confirm it by placing the spherocylinder combination.

Irregular Astigmatism.—This condition is either in the cornea or lens, generally in the former, making it difficult in any instance to study the refraction, as the reflex is more or less obscured by areas of darkness, so that to study the condition the observer may have to change his working distance toward or from the eye. The kinetoscopic picture obtained by moving the mirror so as to make the light describe a circle around the pupillary edge of the iris is quite diagnostic of the corneal condition. Whatever result is obtained, the observer must take care to refract in the area of the cornea that will correspond to the small pupil when the effects of the cycloplegic pass away. It is best in these cases to retain the correction found as a guide in a postcycloplegic manifest refraction.

Conic Cornea.—In this condition the observer is impressed at once with the bright, round, central illumination that moves opposite to the movement of the mirror, the peripheral movement being with the mirror, unless the margin is myopic also, but of less degree. The best way to refract a case of this kind is to follow the suggestion given for refracting cases of irregular astigmatism.

RETROFLEXION.—See Uterus (Retrodisplacements).

RETROPHARYNGEAL ABSCESS.—Abscess behind the pharynx or esophagus. It is due to caries of the cervical vertebræ, or, more rarely, to suppuration of the retropharyngeal lympathic glands. Again, it may have an idiopathic origin, as is the case with scrofulous, tuberculous, and rachitic children. See Spine (Caries).

Symptoms.—At first there is difficulty in swallowing, and to this are soon joined stiff neck, tenderness of the cervical vertebræ, and the snuffling voice. Later, the head is bent strongly backward as far as possible to prevent dyspnea; respiration becomes difficult and stertorous, but not whistling, as in croup, while the facial muscles twitch, and speech is unintelligible. The posterior wall of the pharynx, at first only reddened and somewhat swollen, soon evidently protrudes as a fluctuating tumor, which sometimes crowds forward the uvula. Finally, the abscess opens, and an enormous quantity of pus is poured forth into the mouth, and if this happens during sleep, the pus may flow down into the larynx and result possibly in suffocation.

Prognosis is serious, though not necessarily fatal.

Treatment.—The patient should be put to bed and small pieces of ice used locally. Timely incision must be employed after the abscess forms, in consequence of suppuration of the lymphatic glands; but if the abscess arises from caries of a cervical vertebra, incision must be delayed until there is real danger from suffocation. After opening, rest in bed, lying on the back, for months is necessary. Iodid of iron may be prescribed.

RETROVERSION.—See Uterus (Retrodisplacements).

REVULSIVES.—Therapeutic agencies designed to withdraw the blood from or to counteract the tendencies toward a morbid focus or process. Such remedies produce increased activity of the general system through reflex influences—that is, they relieve an engorged area by causing a determination of blood to another part. For example, a brisk purgative, cathartic, emetic, or diaphoretic may relieve cerebral congestion or effusion by exercising a derivative effect. Revulsives are closely allied to counterirritants. The chief revulsive is croton oil. Pilocarpin is not used without danger.

RHACHITIS.—See Rickets.

RHAGADES.—Linear cracks or fissures in the skin, whether due to injury or to disease. They are most frequently seen on the palmar and plantar surfaces of the hands and feet, at the angles of the mouth, at the anus, and at the flexures. They are painful on movement. They are often the early manifestations of congenital syphilis, the secretions from these lesions being very virulent, and constitute a frequent source of infection.

RHAMNUS PURSHIANA.—See Cascara Sagrada.

RHATANY.—See Krameria.

RHEUM.—See Rhubarb.

RHEUMATISM, ACUTE ARTICULAR. Synonyms.—Rheumatic fever, inflammatory rheumatism.

Rheumatism is an acute infectious disease characterized by high fever, inflammation of the large joints, acid sweats, and a disposition to cardiac involvement.

Etiology.—No specific bacterium has yet been discovered and the distinct causative factor is still unknown. There is evidence of some severe poison circulating in the system, having a predilection for the joints, endocardium, and other serous membranes.

Heredity, damp climate with sudden changes in the temperature, exposure to the cold and wet, lowered vitality, are all conducive to rheumatism. It is a disease of young adults and has a tendency to recur. Of the different theories that have been advanced as to the causes of rheumatism may be mentioned (1) metabolic, (2) nervous, and (3) germ theory. Most authorities at the present time admit that the disease is infectious.

Various microorganisms have been isolated from the exudate of the joints of rheumatic patients, which have caused arthritis and endocarditis in lower animals. Probably, as Flexner and Barker have suggested, acute articular rheumatism may be caused by the infection of the blood by any one of several species of pyogenic organisms, at a time when the conditions were not favorable to the development of a general septicemia, but which may produce an inflammation of one or more serous membranes; hence may occur a pericarditis, pleurisy, or peritonitis of rheumatic origin.

H. C. Wood, Gurich, etc., have shown that suppurative conditions in the tonsils or teeth may be the fundamental cause of acute articular rheumatism and other general conditions.

Other affections, such as scarlet fever and gonorrhea, are associated with a synovitis which closely resembles acute rheumatism, but are due to the specific cause of each of those diseases, and are not truly rheumatic.

Pathology.—The membranes and ligaments show a high grade of inflammation, being reddened, swollen, and there is an effusion of albuminous fluid into the joint-cavity, containing many leukocytes and flakes of fibrin. The inflammatory process producing an increased amount of fibrin in the circulating medium is one of the marked characteristics of this disease.

Usually, the attack ends in recovery, but there may be a hyperplastic proliferation of the synovial membrane, fibrous metaplasia of the cartilage, and fibrocartilaginous ankylosis of the joint.

The blood changes in rheumatism are very marked. Rapid anemia develops early and the red cells may show a loss of 1,500,000 per cubic millimeter; there is a corresponding loss of the hemoglobin, which may be reduced to 50 percent; leukocytosis is the rule, and the white blood-corpuscles may run as high as 39,000 per cubic millimeter. The fibrin is greatly increased. Lactic acid is in excess.

Symptoms and Clinical Course.—The onset is usually quite sudden, although there may have been a history of anorexia, sore throat, pains in the affected parts, or a general body "ache." The inflammatory process first attacks the larger joints, which become reddened, swollen, and excessively tender. Often the inflammation may subside quickly in one joint to attack another. The parts most often affected are the joints of the knee, elbow, shoulder, wrist, and ankle. Occasionally, however, one joint alone is involved. There is a sudden onset of high fever, 103° to 104° F., and the pulse is usually greatly accentuated. With the onset of fever acid sweats occur, and the patient may be bathed with the excretion almost constantly. The sour odor is quite characteristic. The urine, as in gout and lithemia, is high-colored, scanty, and loaded with an excess of uric acid and urates.

Complications.—(1) Hyperpyrexia; (2) endocarditis (very common); (3) pericarditis; (4) myocarditis; (5) pneumonia; (6) pleurisy; (7) cerebral symptoms, as delirium, convulsions, meningitis; (8) cutaneous symptoms—scarlatiniform rash, urticaria, purpura; (9) rheumatic nodules. (10) peritonitis.

Sequels.—Chorea, acute nephritis, exophthalmic goiter and chronic joint changes.

Diagnosis.—The following table illustrates the characteristic points of the affections likely to be confused with rheumatism:

GOUT.	SEPTIC ARTHRITIS.	OSTEOMYELITIS.
1. Occurs late in life.	1. Septic focus, tending to suppuration, present. Onset slower.	1. History of long-continued pain, which is worse at night.
2. Fever not high.	2. Hyperpyrexia not marked.	2. Moderate fever.
3. No acid sweats.	3. No acid sweats..	3. Acid sweats absent.
4. Affects small joints.		4. Often affects long bones.
	5. Heart-lesions rare.	5. Heart-lesions rare.

Other forms of infectious arthritis such as scarlatinal, gonorrheal, and also tuberculous and traumatic must be eliminated.

Prognosis is guardedly favorable. Complications are very common. Recurrence and a crippled heart are to be feared. Occasionally the disease becomes subacute, all the symptoms becoming less prominent but more prolonged. Rarely it may become chronic. The subacute type may exist independently of any previous acute attack and is markedly resistant to treatment.

Treatment. The parts must be placed at absolute rest, and the patient should lie between blankets. It is well to envelop the affected joint in soft wool or flannel.

The diet should be composed of light broths, soups, beef-juice, milk, while there is fever; tea and coffee should be restricted to the minimum; vegetables and fruits of all kinds may be allowed with each meal.

The hyperpyrexia should be constantly watched, and is best controlled by the cold bath or cold packs. The remedy which seems to be most curative is some pharmaceutic preparation of salicylic acid, such as sodium salicylate:

℞.	Sodium salicylate, Aromatic elixir,	each,	ʒ iij
	Water, add enough to make,		℥ iij.

One teaspoonful every 4 hours.

If not well borne by stomach, the salicylates may be given by rectal injection of 20 to 40 grains.

The bowels should be evacuated with fractional doses of calomel—1/4 grain may be given every hour until 6 doses have been taken—followed by 1/2 ounce of Rochelle salt. Rochelle salt (1/2 ounce) may be given every 2 days to keep the bowels open.

The function of the kidneys should be carefully considered, and diuretics are distinctly indicated.

℞.	Lithium citrate,	ʒ jss
	Sweet spirit of niter,	ʒ v
	Solution of potassium citrate,	℥ ij
	Simple elixir,	ʒ iv
	Water, add enough to make	℥ iv.

Two teaspoonfuls every 3 or 4 hours.

℞.	Potassium citrate,	ʒ iij
	Peppermint water,	℥ j
	Water, add enough to make	℥ iv.

Two teaspoonfuls every 3 or 4 hours.

Conjointly with the salicylates and alkalies, phenacetin may be used for the pain. Sometimes morphin may be necessary.

Aspirin (*q. v.*) in doses of 5 to 15 grains has been proved to be a most efficient substitute for the older salicylates, as it has the advantage of not producing the unpleasant effects of the latter.

A healthy action of the skin may be preserved by the use of flannel bedding and hot drinks, such as lemonade, hot beef-juice, and soups.

Local Treatment.—A piece of flannel may be dipped in a mixture of lead-water and laudanum, applied to the affected part, and the whole enveloped in wool or flannel and kept at rest.

℞.	Tincture of opium,	ʒ iv
	Solution of lead subacetate,	℥ iijss.

One tablespoonful to a pint of water.

℞.	Belladonna liniment,	ʒ iv
	Soap liniment, add enough to make	℥ iij.

Apply on flannel cloth once daily.

Either of these local applications may be covered with oiled silk. A liniment containing salicylic acid is often very efficacious. Oil of gaultheria in olive oil (1:2) is excellent for local application.

Should endocarditis supervene, successive blisters should be applied over the heart. An ice-bag over this area often relieves pain, lowers the temperature, and lessens the frequency of the heart-beat.

As soon as the patient is able to be out of bed, massage and electricity applied to the joints are valuable, and tonics are necessary:

℞.	Strychnin sulphate,	gr. j
	Quinin sulphate,	ʒ ij
	Mass of carbonate of iron,	ʒ jss.

Make into 50 pills. One pill after each meal.

℞.	Elixir of phosphates of iron, quinin, and strychnin,	℥ iv.

Teaspoonful after each meal.

RHEUMATISM, CHRONIC ARTICULAR.—A chronic inflammation of the soft parts of the joint, not due to trauma, or tuberculosis or septic infection.

Etiology.—Same as acute, except that it occurs usually late in life and especially among the working-class. Though as a rule appearing independently, it may be a sequel to the subacute form or it may be followed by an acute or subacute attack. Present research is pointing to microbic origin.

Pathology.—Similar to the acute but more pronounced. The capsule, tendons, and their sheaths are thickened and cause increase in size of the joint. Neuritis and muscular atrophy may supervene about the joint. Ankylosis may occur.

Symptoms.—The main symptoms are pain increased by movement and stiffness diminished by exercise. These are augmented by cold and damp weather. Tenderness and slight swelling may be found. Later ankylosis may occur. Fibrous changes of the heart muscle and valves are frequent.

Prognosis.—While life is not shortened, the disease generally progresses.

Treatment is mainly preventive. If subject to exposure, the patient should select an occupation which is less liable to increase the danger of an attack. Nutrition should be preserved by good food. As long as the condition of the patient permits, out-door exercise should be insisted upon. Tonics, such as iron, strychnin, cod-liver oil, arsenic, should be administered. The bowels should be kept open with salines or laxatives, such as—

℞.	Fluidextract of cascara, Glycerin,	each, ℥ j.

Or a pill containing aloin (1 grain), strychnin (1/60 grain), and belladonna (1/8 grain) may be given.

Should indigestion be present, lactopepsin (10 grains) may be given after meals.

℞.	Pepsin, Dilute hydrochloric acid,	each, ʒ ij
	Compound tincture of gentian,	℥ j
	Elixir of curacoa,	ʒ iv
	Water, add enough to make	℥ iij.

One teaspoonful after meals.

Any of the diuretics mentioned for the acute form may be given if the urine becomes high-colored or scanty.

Hot baths at night may be taken two or three times a week, and followed by thorough massage. Massage aids in breaking up the old adhesions and helps to restore the normal circulation. Vibratory massage may be beneficial. It is well to keep the affected joints wrapped up in flannel. Iodin or blisters may be useful. Sometimes an ointment of ichthyol, mercury and belladonna will prove valuable. Chloral-camphor rubbed in well is effective. Scotch douches and moist compresses (hot and cold) may aid in the treatment. For great pain the actual cautery may be tried. The galvanic current may also be used for a period of 20 minutes 3 times a week. The hot dry air treatment is effective in some cases. Great relief may follow the application of the high frequency current. Of internal remedies not one has been found to be of any distinct advantage. Sometimes an acute exacerbation may be controlled by salicylates. Potassium iodid (10 grains) may be given after meals for periods of 10 days or 2 weeks. Guaiac has been recommended; it should be given in the form of troches. The following prescription is commended:

℞.	Guaiac,	ʒ iij
	Oil of lemon,	♏ vj
	Oil of cloves,	♏ ij
	Sugar,	ʒ j
	Acacia,	ʒ ss
	Confection of rose, a sufficient quantity.	

Divide into 30 troches. One after each meal.

See also JOINTS (Diseases).

RHEUMATISM, INFANTILE.—It should be remembered that articular symptoms are relatively less prominent in children than in adults. The same is true of the profuse acid sweating so frequent with the adult. On the other hand, wandering rheumatic pains—the so called "growing pains"—and rheumatic tonsillitis are among the more frequent symptoms of rheumatism in children. Pain, fever, swelling of the joints, and heart symptoms occur, of course, in typical cases of rheumatism, but of these the heart symptoms are chiefly to be dreaded. Pain is quite likely to be slight and more of the nature of tenderness and disinclination to move rather than sharp pain, and hence is often mistaken for a sprain. Fever, as a rule, is neither high nor long-continued, so that the heart symptoms are often the first to attract the attention of the parents. It is not always easy to decide whether we have to do with endocarditis, pericarditis, or both combined; but while it will be found that both are attended with restlessness, labored breathing, and elevated temperature, we expect to find a mitral murmur in endocarditis, systolic, and near the apex (ulcerative endocarditis is attended by fever and chills). Pericarditis usually is more painful than endocarditis, generally gives friction sounds, with the cardiac sounds more distinctly at the base than at the apex.

Diagnosis.—It is by no means always easy to make a positive diagnosis of rheumatism in a child unless there is coincident heart trouble. A rheumatic family history, recurrent tonsillitis, or chorea, may give us valuable hints as to the attack, but antirheumatic remedies are often the best means of differentiation in doubtful cases.

Treatment.—It is of first importance that the child should be clad in a flannel night-gown, put to bed, and kept under blankets until pain and tenderness have disappeared. If the joints are swollen and tender, they should be wrapped in cotton batting after rubbing with liniment; one of efficiency is the following:

℞. Oil of gaultheria, } each, ʒ ss
Spirit of chloroform, }
Soap liniment, ʒ iij.

Of internal remedies the salicylates justly hold the first place, though they sometimes produce hebetude and depression of the heart's action without any appreciable effect in warding off heart complications. Aspirin is usually preferable to sodium salicylate because of its having no by-effects. Da Costa prefers the bicarbonate of sodium in mint-water until the urine becomes alkaline. Quinin sometimes acts well when all the usual remedies have failed, and opiates, especially codein, are permissible for pain. Iodids are the chief reliance in pericarditis and endocarditis. Absolute rest must be insisted upon.

RHEUMATISM, MUSCULAR (Rheumatic Myositis, Myalgia).—A painful condition of voluntary muscles and their aponeurotic coverings, especially aggravated by motion and pressure. It affects especially large muscles, such as those of the neck, the shoulders, the arms, the intercostal muscles, the back, the thighs, and the calves of the legs.

Etiology and Pathology.—Exposure to cold, and especially to drafts of cool air, as from an open door or window, are the most frequent causes. The acute form, at least, does not wander, but persists in the muscles primarily attacked until relieved. Its true nature is unknown, and whether it is an affection of the muscular substance or of the intermuscular connective tissue or of the minute branches of sensory nerves distributed throughout the muscles is also unknown. Certain forms of muscular rheumatism, especially of the back, are ascribed to gout. An infectious origin has been suggested. It is sometimes associated with articular rheumatism, but has probably a different etiology, though similar exciting causes operate to produce it. Similar pain often succeeds muscular strain, but it is doubtful if this should be called muscular rheumatism. The division of muscular rheumatism into acute and chronic is based upon the duration of the pain and disposition to recurrence. The term chronic is justified for those forms which recur with changes in the weather, and are either excited or relieved by them. It, too, is less localized than the acute. On the other hand, it is not inaptly at times called wandering. It is more frequent in men than in women, because the former are more exposed to its cause.

Symptoms.—The only invariable symptom is pain, aggravated by motion or pressure. Sometimes there is swelling. It is usually rather sudden in its onset, requiring at most but a few hours, and often less, to develop it. It is never accompanied by marked constitutional disturbance. The pulse may be somewhat accelerated and the temperature approach 100° F., but more often there is no fever at all.

Muscular rheumatism is specially named according as it involves certain muscles. Thus, **lumbago** is a painful affection of the lumbar muscles and their tendinous attachments. The attacks come on under the conditions already named, but sometimes suddenly without discoverable cause.

Stiff neck, or torticollis, is an affection of the side and back of the neck, forcing the patient to hold his head to one side as the situation of least discomfort, and when he desires to turn his head, he is forced to turn the whole body. Sometimes it becomes chronic and is rather difficult to cure. It is more frequently met with in children and young adults. **Omalgia** is a similar condition of the muscles of the shoulder and upper arm, making motion exquisitely painful. Ankylosis of the shoulder-joint may be caused by delayed motion. **Pleurodynia** affects the intercostal muscles and makes breathing and coughing very painful, while a deep breath becomes impossible, and sneezing an agony. The pectoral and serratus muscles may also be involved when the pain is felt in their locality. It is more frequent on the left side.

The duration of the acute form is brief, seldom lasting more than a few days, though there may be a tendency to relapse. The chronic forms are indefinite in duration.

Diagnosis.—This is easy for the coarser acute forms of omalgia, stiff neck, and lumbago. Muscular rheumatism may, however, be confounded with neuritis and neuralgia. In muscular rheumatism the pain is more diffuse; in neuritis there are pain and tenderness, more localized and along the course of large nerve-trunks. Muscular rheumatism and neuritis are distinctly worse on motion; neuralgia is less so. Rheumatism is commonly relieved by the warmth of the bed; neuritis may be aggravated; while neuralgia is indifferent, though increasd by cold winds. Pleurodynia is sometimes difficult to distinguish from intercostal neuralgia, but attention to the points named will prevent mistakes. Neuritis of the brachial nerve-trunks resembles omalgia, but the former is early followed by atrophy, while muscular rheumatism is not. From pleurisy, pleurodynia is easily distinguished by the absence of fever and of physical signs. The lancinating pains of locomotor ataxia and the pains of incipient disease of the vertebræ resemble at first those of lumbago, but the special symptoms of these diseases are soon superadded.

Treatment.—The acute form of muscular rheumatism is occasionally amenable to treatment by the salicylates and salicin. Salipyrin and aspirin have been used with great benefit. The group of muscles treated must be placed at absolute rest, and in the case of the thorax this is best accomplished by strapping the side with adhesive plaster. Rest may, however, be overdone; and in the case of muscles like those of the shoulder, atrophy may result from too prolonged rest. Another measure of great value is dry heat, applied by means of a hot-water bag covered with flannel, or by a warm flat-iron. A flannel cloth should be interposed. With these measures massage may be associated. Of less permanent utility are hot poultices. although they allay pain at least. The same effect is accomplished by moist hot air or vapor (steam) baths, which in special establishments can be localized.

The chronic form is also treated by massage, passive motion, and electricity, either the induced or direct current. Counterirritation by liniments, such as those made with choloroform, ammonium hydrate, or turpentine, have long enjoyed a reputation, but at the present day it is beginning to be questioned as to whether, after all, it is not the friction rather than the liminent itself that produces the good effect. Acupuncture, consisting of the puncture by needles deeply thrust into the skin, is a measure that has some advocates, especially in the treatment of lumbago. Hydrotherapy is more likely to be useful, and here the warm or cold pack is the better method of application. Dry cupping is also often of service. General treatment should not be neglected; cod-liver oil, iron, strychnin, quinin, and good food should be given when the patient is run down (Tyson).

Vibratory massage or the hot dry air treatment may be beneficial. The high-frequency current has given excellent results.

RHEUMATOID ARTHRITIS.—See Joints (Diseases).

RHINITIS, ACUTE (Coryza). **Varieties.**—(1) Simple rhinitis; (2) specific rhinitis.

Etiology. Simple Rhinitis.—(1) Exposure to the cold and wet; (2) inhalation of dust or chemicals; (3) predisposing causes, such as rheumatic diathesis, tuberculosis, and asthma.

Specific rhinitis is due to diphtheria and scarlet fever.

Pathology.—There is vasomotor dilatation with engorgement of the blood-vessels in the mucous membrane, the latter being covered by a mucoserous exudation. The membrane is red and swollen.

Symptoms.—The symptoms are generally ushered in with a severe spell of sneezing, dryness of nasal chambers, hoarseness, headache, and a feeling of chilliness. Large quantities of mucoserous material may be expelled after a few hours, and the choanæ may be entirely occluded by thick, tenacious material. See Nose (Examination). Often the Eustachian tube becomes clogged up, causing a ringing or buzzing noise, and temporary deafness may be set up.

Prognosis is favorable for simple acute rhinitis.

General Treatment.—Probably the patient would always be cured of his cold quicker if he could be induced to go to bed, or, if not, to remain in a room kept at the same temperature during the day.

Coexisting with the congestion of the nasal mucous membrane there is very likely a partial cessation in the activity of the emunctories of the body; therefore it is most important to use means to promote their activity.

The bowels may be moved by means of fractional doses (1/6 grain) of calomel, salines, Seidlitz powders, or solution of magnesium citrate.

To limit the nasal secretion by contracting the capillaries, Lennox Browne recommends:

℞. Tincture of belladonna, }
Tincture of opium, } each, ♏ xx
Camphor water, ℥ iv.
Two tablespoonfuls 2 hours after meals.

Probably that which may give quickest relief is a hot foot-bath taken at bedtime. The water should be as hot as can be borne, and the imbs should be bathed as high up as the knees. Fifteen or 20 minutes may be wel spent in applying this measure of relief, and the process again repeated during the night, and for several consecutive nights if necessary. A small amount of powdered mustard may be added to the bath. Hot drinks, such as lemonade containing a small amount of brandy, may be given after the foot-bath to promote diaphoresis. Quinin (4 to 6 grains) and salol (2 to 4 grains) aid in restoring warmth to the body, and may be used every 3 or 4 hours. Dover's powder (7 grains) is recommended by many good writers.

Local treatment in some cases does good, and in others harm. In the acute stage, if a spray is used at all, only the gentlest force is permissible.

If the anterior naris is entirely occluded, it may be relieved by applying a few drops of a solution of cocain (4 percent) on a pledget of cotton, and the nostril can be subsequently cleansed by means of some form of douche containing an alkaline solution, such as that advised by Carl Seiler—cold cream (1 ounce) or liquid vaselin containing menthol (4 grains)—may be brushed over the nares to relieve congestion. See also CORYZA.

Treatment of Specific Rhinitis.—See DIPHTHERIA, SCARLET FEVER.

RHINITIS, CHRONIC (Chronic Nasal Catarrh).—**Etiology** is the same as that of acute rhinitis, and it may result from an acute attack.

Pathology. Hypertrophic Form.—Cellular infiltration causes an overgrowth of tissue, giving rise to a spongy condition. The process most often affects the middle and inferior turbinated bones, and may be localized. In many cases deflection of the septum has been found, and nasal spurs are common. The surface is covered with a thick tenacious mucus.

Atrophic Form.—Instead of a hypertrophic condition there may be atrophy of the mucous membrane often involving the bone and giving rise to enlargement of the nasal chamber. On the surface of the mucous membrane a greenish or yellowish and very offensive secretion is usually found, containing various microorganisms. Greenish or mottled crusts may be found scattered over the surface of the nares. This form is also spoken of as ozena. See NOSE (Caries).

Symptoms.—There is generally a feeling of stuffiness or inability to breathe through the nostrils, especially noticeable in the morning; a frequent desire to clear the throat; the voice is harsh, indistinct, or nasal in character; the breath-sounds seem forcible or wheezing; the hearing and taste may become impaired, and from the occlusion of the nares the habit of mouth-breathing may be established.

Often only one nasal chamber is affected, and the patient may complain of being able to breathe only through one or the other side of the nose. A physical examination reveals its character.

In the atrophic form headache may be more common, and the secretion, instead of being mucoserous, has a greenish or purulent cast, often containing greenish crusts.

Complications.—Deafness is common.

Diagnosis is based on anterior and posterior rhinoscopy.

Prognosis is guardedly favorable. The condition is prone to reappear.

General Treatment.—While the local treatment of the disease is probably of most importance, the general condition of the patient must never be neglected. Careful inquiry should be made regarding the habits, such as inveterate use of tobacco, overloading the stomach, bathing at unseasonable hours or in water too cold, and also the condition of the digestion and state of the bowels.

If the general system is below par, a tonic—such as the elixir of the phosphates of iron, quinin, and strychnin (1 dram)—is advisable, taken after meals.

The constipation should be treated by appropriate remedies. See CONSTIPATION.

Local Treatment.—The nasal chambers should be throughly cleansed and kept in as healthful a condition as possible by the use of alkaline antiseptic sprays or douches. A good cleansing fluid is composed of listerine (1 part) and water (2 parts).

The fluid for the spray may also be made by dissolving a tablet, according to the formulas of Dobell or Seiler, in about 2 ounces of water, and used by means of the compressed-air apparatus (preferably) or the glass hand-atomizer. Both the anterior and posterior nares are cleared of mucus and dust by this method. The small glass nasal douche seems to be effective in mild cases.

If the compressed-air apparatus is used, much care should be exercised not to use too great a force, as damage to the sensitive membrane may ensue. Usually, a pressure of from 5 to 7 pounds is sufficient. The nasal chambers may be cleansed in this manner 2 or 3 times a week.

Before using the liquids during cold weather it is best to slightly warm them. Carbolic acid should be used with caution about the nasal chamber, as it has been known to produce anosmia.

Subsequent to the cleansing process the following solution feels refreshing:

℞. Eucalyptol, } each, gr. j
Menthol,
Liquid vaselin, ℥ j.
Use as a spray.

A drop or two of the compound tincture of benzoin may then be sprayed over the parts to advantage.

Here a word of warning against the indiscriminate use of the nasal douche is appropriate. In cases of nasal hypersecretion due to other causes than inflammation of the nasal and retronasal mucous membrane, sinusitis, deviation of the septum, some new growth in the nasal cavity, etc., it is still common practice to have recourse to the nasal douche. In the majority of such cases this is useless, and it may seriously injure the epithelium of the nasal mucous membrane. In numerous cases the power of smell was lost in this way, and experiment has shown that no active antiseptic solution is free from danger to the sense of smell. The nasal douche is, also, frequently the cause of distressing headaches, probably accounted for by fluid passing into the sinuses. One of the gravest dangers is that water may reach the middle ear through the Eustachian tube and cause suppurative otitis media.

Sprays or douches keep the parts clean but they do not altogether relieve the hypertrophy. This condition may often be relieved by a partial destruction of the tissue by means of the galvanocautery or chromic acid.

Before these caustics are applied the parts are thoroughly anesthetized by means of a solution of cocain (5 to 10 percent). The cautery point is then plunged into the hypertrophied tissue in a direction parallel with the inferior border of the bone. In mild cases this operation, repeated 2 or 3 times, suffices. In the more chronic forms linear superficial cauterizations may also be made. At least a week should elapse from the time of one application to the next.

Hypertrophies on the posterior portion of the turbinated bodies are best removed with the knife, saw, or suture, as, being in close proximity to the Eutachian tube, the cicatrix formed by cautery might produce harm. There are many operations for straightening septal deviations. The application of chromic acid to hypertrophies has been advised by a few specialists with good results. The parts are anesthetized with a solution of cocain (10 percent), and the acid is applied by means of a metal probe. Its use is not altogether free from danger of poisoning. See Nose (Caries, Deformities).

RHINOPHYMA.—See Acne Rosacea.

RHINOPLASTY.—See Nose (Deformities).

RHINOSCOPY.—See Nose (Examination).

RHUBARB (Rheum).—The dried rhizome of *R. officinale*, *R. palmatum*, or other species of *Rheum*. It contains three closely related anthracene derivatives, *chrysophan*, yielding chrysophanic acid, *emodin*, and *rhein*, which are the cathartic principles; also several bitter resins, a variety of tannic acid, calcium oxalate, starch, sugar, pectin, and other plant constituents. The species of rhubarb cultivated in the United States are devoid of cathartic power, but their leaf-stalks are used as a fruit. Dose of the powdered root, as a stomachic 1 to 5 grains, as a purgative 10 to 30 grains.

Rhubarb is highly esteemed as a cathartic for children on account of the mildness of its action. The tonic and astringent action following its catharsis makes it a valuable agent in diarrheas due to the presence of irritating matter in the bowel, and to correct atonic indigestion accompanied by diarrhea. For hemorrhoids with constipation its gentle action makes it peculiarly suitable, its astringent after-effect being entirely overcome by from 2- to 4-dram doses of olive oil nightly. It may be combined with a mercurial or with sodium bicarbonate. In small doses the tincture is a very efficient stomachic tonic, improving appetite, increasing the flow of the gastric juice, assisting digestion, and promoting the action of the liver without producing any cathartic results. The preparations most in use for children are the aromatic syrup and the mistura rhei et sodæ.

Incompatible with *rhubarb* preparations are: Mineral acids, catechu infusion, cinchona infusion, galls infusion, lead acetate, lime-water, mercuric chlorid, silver nitrate, tartar emetic, zinc sulphate.

Preparations.—**Extractum R.** Dose, 1 to 10 grains. **Fluidextractum R.** Dose, 10 to 30 grains. **Pilulæ R. Compositæ,** each pill contains of rhubarb about 2 grains, aloes 1 1/2, myrrh 1, oil of peppermint 1/10 grain. Dose, 1 to 5 pills. **Tinctura R.,** has of rhubarb 20, cardamom 4, glycerin 10, alcohol and water to 100. Dose, 1/2 to 3 drams. **Tinctura R. Aromatica,** has of rhubarb 20, cinnamon 4, cloves 4, nutmeg 2, glycerin 10, alcohol and water to 100 Dose, 10 to 60 minims. **Syrupus R.,** has of the fluidextract 10, spirit of cinnamon 0.4, potassium carbonate 1, glycerin 5, water 5, syrup to 100. Dose, for an infant, 1 dram; for older children, 2 to 4 drams. **Syrupus R. Aromaticus,** has of the aromatic tincture 15, syrup 85. Dose, as the syrup. **Pulvis R. Compositus,** has of rhubarb 25, magnesia 65, ginger 10. Dose, a teaspoonful. **Mistura R. et Sodæ,** has of sodium bicarbonate 3 1/2, fluidextract of rhubarb 1 1/2, fluidextract of ipecac 1/3, glycerin 35, spirit of peppermint 3 1/2, water to 100. Dose, 1/2 to 4 drams.

In summer diarrhea of children:

℞.	Aromatic syrup of rhubarb,	ʒ vj
	Sodium bicarbonate,	ʒ ij
	Deodorated tincture of opium,	♏ xxxvj
	Peppermint water, add enough to make	℥ iij.

To a child of from 4 to 6 years give a teaspoonful every 3 hours.

RHUS GLABRA (Smooth Sumach).—The dried fruit of *R. Glabra.* The leaves and bark have an astringent and bitter taste, and are also used medicinally. It contains tannin, coloring matter, also potassium and calcium malates.

Fluidextractum Rhoïs Glabræ. Dose, 5 to 30 minims. Sumach-berries form a useful acidulous and astringent drink or gargle in catarrhal pharyngitis, stomatitis, and aphthæ. An infusion (one ounce to the pint) or the official fluidextract may be used as a wash and dressing for ulcers and wounds. Internally the berries are useful remedies for mild catarrhal affections of the stomach and bowels.

RHUS TOXICODENDRON.—See Ivy Poisoning.

RIBS, FRACTURE.—This is a most frequent injury, occurring more often about the fifth to the eighth ribs, in middle-aged males, and in old persons. Direct violence usually produces fractures on only one side of the body, while indirect violence affects one or both sides or breaks one rib in several places. Fractures may be produced by muscular action, as in coughing and sneezing. They are seldom compound, save from gun-shot injury. Fractures of the ribs may be complicated by: An external wound; a wound of the pleura and lung, or pericardium and heart; laceration of a blood-vessel, as an intercostal artery; penetration of the diaphragm; and more rarely by perforation of the peritoneum, and wound of the liver or spleen. Hence they may be followed by emphysema, pneumothorax, hemothorax, hemoptysis, hemopericardium, and later by pleurisy, pneumonia, pericarditis, or peritonitis.

Treatment.—The object of treatment is to so immobilize the fractured rib as to put it in the most favorable state for repair. The erect posture is better than the prone. Displacement outward is corrected by direct pressure, while displacement inward is usually rectified by ordinary breathing or deep breathing brought about by anesthesia. As a temporary expedient only the forcibly applied broad rib-roller may be used. Broad bands (2 inches wide) of adhesive strips, extending from the spine to the sternum, and overlapping freely, applied with the arms held over the head while forced expiration is employed. and being put on from 6 or 7 inches below the seat of fracture successively upward, are commonly used. An inelastic spiral or figure-of-eight bandage may be put over the strips. The strips should be worn for 3 or 4 weeks; fresh pieces being reapplied about once a week, the chest being rubbed with soap liniment, dried, and excoriations treated, as by zinc ointment. Cold, damp, and drafts are especially to be avoided; the diet should be nonstimulating, and cough should be checked by opiates and expectorants. In those over 60 years of age stimulating expectorants are called for, or a steam-tent may be used several times daily.

Confinement in bed is necessary when fracture of the rib is complicated with dangerous visceral injury. The circulation is to be reduced, the patient treated with adhesive strips as before described, put to bed, and diaphoretics and expectorants—such as a mixture of squill, ipecacuanha, ammonium acetate, chloroform, and opium—employed. When there is emphysema, it usually disappears of itself, but it may be necessary to open the cellular tissue and employ pressure under antiseptic precautions. If a sudden attack of dyspnea comes on, it is then advisable to bleed the patient almost to syncope. Pleurisy ensuing from fracture of the rib is mostly local, and is to be treated the same as ordinary inflammations of such membranes. So severe may be the visceral injury, or the patient's state, that it may be advisable to resect a rib, and on investigation treat such complication as may be found, and drain. Hemorrhage from an internal bleeding point indicates the resection of a rib, finding the bleeding point, and ligation thereof. See PLEURISY.

When the costal cartilages are fractured, an attempt should be made to reduce the displacement: if forward, by drawing back the shoulders; or if backward, by employing deep inspiration. A truss may be employed over the projection caused by a broken cartilage for a day or two to reduce the deformity. The case should be dressed and treated the same as a fractured rib—removing the dressings in 4 weeks.

RIBS, RESECTION.—See PLEURISY (Treatment).

RICINUS.—See CASTOR OIL.

RICKETS (Rachitis).—A disease characterized by nutritional changes, deformities of the bones, weakness of the muscles and ligaments, and various nervous disorders. It occurs especially between the ages of 6 months and 2 years. See BONE (Diseases).

Etiology.—The principal cause of rickets is improper feeding. Unhygienic surroundings, hereditary weakness, and feebleness of the digestive powers are also important factors in producing this disease. Breast-fed babies are seldom affected; but when the mother's milk is scanty and poor, as is likely to be the case when the child is weaned late, rickets may occur. Those suffer most frequently who are artificially fed, who receive their nourishment irregularly, and are fed on improper substances, as starches, condensed milk, cow's milk boiled, unmodified, or of an inferior quality, and the various proprietary foods. As the class that most often rear their children in this manner are also those whose hygienic surroundings are of the worst, naturally it is among them that rickets is most common.

Pathology.—Bronchitis is very common. The stomach and intestines are often dilated; the liver may be enlarged, and enlargement of the spleen is frequently present. The only characteristic lesions of rickets, however, are those found in the bones. There are an increased production of cartilage at the epiphysis and excessive cell growth beneath the periosteum, while the process of ossification goes on very slowly or is entirely arrested, which accounts for the unnatural flexibility present in rachitic bones. Normally the bones contain about two-thirds inorganic and one-third organic matter; but in rickets there is a marked deficiency in the proportion of lime salts, and the proportions mentioned above may in severe cases be reversed—there being present twice as much organic as inorganic matter.

There are also characteristic changes in the form of the bones, the principal ones being curvatures and enlargement of the epiphyses of the long bones, and thickening of the bones of the skull.

Symptoms.—The early symptoms may be so mild as to be overlooked. In more severe cases there will be restless sleep, profuse sweating of the head, digestive and nervous disturbances, and perhaps slight fever.

Bending of the ribs (the rachitic rosary), caused by nodules formed at the junction of the costal cartilages and the ribs, and enlargement of the wrist-joints are the earliest noticeable changes in the bones. Dentition in most cases is delayed or arrested, and the fontanels remain open. The appetite is capricious; constipation, which may alternate with diarrhea, is usually marked, and the abdomen is enlarged (often enormously) and tympanitic.

Most rachitic patients are anemic, fat, and flabby, and they are very liable to suffer from inflammations of the mucous membranes, as gastro-intestinal catarrh, bronchitis, and pneumonia. Tenderness of the epiphyses and bones may be present, but is neither a constant nor reliable symptom, and when present to a marked degree suggests scorbutus rather than rickets.

Nervous symptoms are frequent and important; the nerve-centers are in an unstable condition and discharge on the slightest provocation, giving rise to restlessness at night, to laryngismus stridulus, tetany, or general convulsions.

The deformities most uniformly found as a result of rickets are flat feet, enlarged epiphyses, bow-legs or knock-knees, a malformed thorax (pigeon-breast), and a large square head. In severe cases the spine may become deformed, and not infrequently there occur deformities of the pelvis.

The course of rickets is chronic, the active symptoms continuing for a period of from 2 or 3 to 18 or 20 months. The earliest symptoms of improvement are a diminution of the nervous symptoms, and of the head sweats, improvement in the anemia, and an increase in the muscular power. When improvement once begins, it usually goes steadily forward, relapses being exceedingly rare.

Diagnosis.—The early symptoms mentioned—

sweating of the head, craniotabes, great restlessness at night, and delayed dentition—when occurring together are diagnostic of rachitis, but in cases when these symptoms are obscure, the exact nature of the affection may be doubtful before the bones show the characteristic changes.

Hereditary syphilis presents some symptoms which may be taken for rickets, but the lesions of the skin and mucous membrane and the difference in the character of the bone lesions are diagnostic. When there is enlargement of the long bones in syphilis, it is not confined to the epiphysis but involves the end of the diaphysis, and it often is accompanied by a condition that closely simulates a callus. There is a distinct tendency to fracture in syphilis rather than to the bending that is common in rickets.

The diagnosis between rickets and scurvy is mentioned under the description of the latter disease. See SCURVY.

Prognosis.—Many dangers attend rickets on account of the weakly state of the child. He is especially liable to bronchitis and bronchopneumonia, which are particularly dangerous owing to the weakness of the ribs and the feebleness of the respiratory muscles.

One of the effects of rickets is to stunt the child's growth as well as to leave him with deformities. The lowering of the health produced by rickets may last for many years, but in the majority of cases the symptoms and signs of this disease, if they come under treatment, disappear, and the child may grow up into a healthy adult.

Treatment.—The treatment of rickets is chiefly dietetic and hygienic. When possible, the patient should be taken to live in the country, or better—as the salt air is especially beneficial—at the seashore. He should be kept in the open air as much as possible, guarding against bronchitis by keeping him well covered with a woolen blanket and by keeping his feet warm. The living room should be accessible to sunlight, and the child should be given a daily warm salt-bath, followed by an inunction of cod-liver oil.

The food should be adapted to the child's age, and given in proper amounts and at regular intervals. See INFANT FEEDING. The sugar and starches should be reduced in the food, and the proprietary infant foods not given. Beef-juice should be added to the infant's diet. This is prepared by taking 1 pound of finely chopped round steak, 6 ounces of cold water, and a pinch of salt; place in a covered jar and stand on ice or in a cold place for 5 or 6 hours. This is now strained and all the juice squeezed out of the meat by placing it in coarse muslin and twisting it very hard. One teaspoonful of this may be given in the milk, or separately before taking the bottle, 3 times a day to a child 6 months old, increasing the amount gradually to 4 to 6 tablespoonfuls daily at 11 or 12 months. From 10 to 18 months there should be added to the diet list eggs, scraped raw meat, orange-juice, and fresh fruits.

Cod-liver oil should be given in all cases, and, except in hot summer weather, it is usually well tolerated. It is best given pure, the dose being from 10 drops to a teaspoonful 3 times a day, according to the child's age and its capacity for digesting it. It may be combined as follows:

℞.	Syrup of lactophosphate of lime, Lime-water,	each,	℥ ij
	Cod-liver oil,		℥ iv.

From 1/2 to 2 teaspoonfuls 3 times a day.

Or with phosphorus:

℞.	Phosphorated oil,	ʒ ss
	Cod-liver oil,	℥ vj.

From 1/4 to 1 teaspoonful 3 or 4 times a day.

For the anemia iron should be given. One or 2 drops of the syrup of iodid of iron may be added to each dose in the above recipes, or it may be given as in one of the following:

℞.	Syrup of iodid of iron,	ʒ j to ij
	Simple syrup,	℥ iij.

One-half of a teaspoonful in a little water 3 times a day.

℞.	Citrate of iron and quinin,		gr. x
	Cod-liver oil, Glycerin,	each,	℥ ij.

One-half to 1 teaspoonful 3 times a day.

For the relief of sweating when profuse give 1/800 to 1/200 grain of atropin 3 or 4 times a day.

When digestive disturbances are present, they should receive appropriate treatment. As a rule, such simple remedies as calomel and soda, in small doses, and essence of pepsin will meet the indications.

Many of the deformities resulting from the softness of the bones may be prevented by precautionary measures. The children must not be allowed to sit up before their vertebral column will support them. They must not be carried about in the erect posture nor on the same arm always, and they must be discouraged from walking before their limbs are sufficiently strengthened. When there is craniotabes (thinning of the skull), the weight of the head must, as much as possible, be kept from falling upon that part of the skull. In very many cases slight deformities of the extremities are outgrown. Friction and intelligent manipulation of the extremities will do much to strengthen the muscles and straighten the bones, but braces should be applied if the deformity does not yield to these measures.

The deformity of the spine may be much benefited by postural treatment. The patient should lie upon a hard bed, no pillow should be allowed under the head; but in severe cases one should be placed beneath the back so that the spine is slightly raised. For a few minutes every day the child should be placed upon the face and the deformity overcome by raising the buttocks while pressure is made upon the spine. Friction and massage should be employed to strengthen the muscles. In severe cases an apparatus, as a brace or plaster jacket, should be worn a few hours every day. Little can be done toward correcting deformed bones by apparatus after the child is 2 1/2 years old, as the bones have then become hardened. After this time surgical treatment is the only means of cure.

RIGG'S DISEASE.—See Pyorrhea Alveolaris.

RIGOR.—The phenomena—all referable to the central nervous system—that constitute a rigor frequently portend serious illness. The attack frequently shakes every muscle, the teeth chatter, the face twitches, eyelids and mouth-corners irregularly move or twitch, temperature often rises, and the sensation of intense cold ensues. Besides other motor symptoms, disturbances of function occur. A rigor is sometimes produced by traumatic influence, as after sudden dilatation of the urethra by a catheter; but we are by no means enlightened as to the pathologic state of the central nervous system that produces the rigor preceding the onset of disease.

A rigor occurring during the course of an illness, and not due to malaria, should suggest pus formation or thrombosis. In malarial fever and in acute diseases, especially pneumonia and erysipelas, rigors are usually premonitory symptoms.

The most usual **treatment** of a rigor has been that of stimulation and heat, through the use of brandy and hot water, hot bottles, and blankets. It is the disturbance of the heart that urges the necessity for treatment; and any drug that narcotizes the nerve-centers has a preventive effect on rigors. Chloroform will arrest a rigor, and morphin and quinin will prevent and arrest rigors due to catheterism. Practically, the administration of 1/4 to 1/3 grain of morphin hypodermically, with maintenance of external heat through hot-water bottles, hot blankets, or heated air, and the occasional use of hot alcoholic drinks, will suffice. See Chill.

RIGOR MORTIS.—The muscular rigidity that occurs shortly after death, due to chemic changes resulting in the production of myosin. See Death (Signs).

RINGWORM OF THE BEARD (**Tinea Sycosis; Barbers' Itch**).—A contagious, vegetable parasitic affection, attacking the hairs and hair follicles of the bearded region.

Symptoms.—The disease begins with the appearance of small, rounded, scaly, reddish patches (tinea circinata). The hairs and their follicles soon become invaded, with the production of swelling and induration and the appearance of nodular or lumpy tumefactions. Numerous pustules mark the sites of the hair follicles. These soon rupture and give exit to a yellowish pus, which dries in the form of crusts. The hairs are dry and brittle, and either break off or fall out. The chin, neck, and submaxillary region are the regions most frequently affected. The upper lip is almost never attacked. Itching and burning are present in varying degrees. The disease, when untreated, persists indefinitely. Unless treatment is extremely thorough, relapses are liable to occur.

Etiology.—The disease is due to the invasion of the hair follicles by the ectothrix variety of the trichophyton fungus. The affection is usually acquired in the barber shop. The disease, however, is not infrequently contracted from horses and cattle. When acquired from such sources, it is apt to be more severe.

Pathology.—Both the hair and the hair follicles contain the fungus. As in tinea tonsurans, the spores greatly predominate over the mycelium. Secondary inflammation of the follicles and surrounding tissues, with swelling, infiltration, and suppuration, are present in well-marked cases.

Diagnosis.—The chief affection to be differentiated is ordinary sycosis.

Tinea Sycosis.	Sycosis.
1. A typical case shows large, lumpy, or nodular tumefactions.	1. A typical case shows small, discrete pustules pierced by hairs.
2. Hairs broken and easily extracted. Roots usually dry.	2. Hairs firmly attached until free suppuration occurs. Roots often swollen with pus.
3. Course rapid. Marked changes from week to week.	3. Course slow. Little change from week to week.
4. Upper lip almost never involved.	4. Upper lip frequently involved.
5. Trichophyton fungus in hairs.	5. Absence of fungus in hairs.

Prognosis.—The disease is at times rebellious to treatment, although most cases get well in 1 or 2 months. Relapses are common.

Treatment.—The treatment consists of epilation and the use of parasiticide applications. Crusts should be softened with bland oils and then removed with soap and warm water, after which the part should be shaved. Shaving and epilation of the diseased hairs should then be practised upon alternate days.

The following applications are all efficient:

℞.	Precipitated sulphur,	ʒ j
	Petrolatum,	℥ j.
℞.	Sodium thiosulphate,	ʒ j
	Water,	℥ j.
℞.	Mercuric chlorid,	gr. j
	Water,	℥ j.

These should be applied 2 or 3 times a day.

RINGWORM OF THE BODY (**Tinea Circinata**).—A contagious, vegetable parasitic disease, due to the trichophyton megalosporon, or large-spored fungus, or the microsporon audouini or small-spored fungus, and characterized by annular vesiculosquamous patches upon the body surface. Of the trichophyton there are two main varieties, the endothrix which causes the transitory forms of macules, and the ectothrix to which is due the severely inflammatory type of the disease. Ringworm of the general surface or the bearded region is due generally to the ectothrix; that of the scalp is usually caused by the endothrix. In children, however, ringworm of the scalp is as a rule due to the microsporon though occasionally to the trichophyton.

Symptoms.—The disease begins as one or several rounded or irregular pea-sized, hyperemic, scaly patches. In a few days these assume a circular shape with minute papules or vesicles around the circumference.

Peripheral spreading and central healing progress hand in hand, so that the patches when fully developed are distinctly annular or ring-shaped. They are of a dull pinkish or reddish color, with slightly elevated borders, which exhibit a branny desquamation. Itching is usually slight. The face, neck, and backs of the hands are the most frequent seats.

In **tinea cruris** (*eczema marginatum, tinea trichophytina cruris*) the clinical appearances are so much modified as frequently to simulate an eczema intertrigo. The patches are large, diffuse, of a dull or brownish-red color, with a well-defined marginated, and at times slightly elevated, border. Outlying circinate patches are usually present.

The eruption spreads with remarkable rapidity, successively involving the thighs, groins, genitals, mons veneris, and nates. Eczema is apt to complicate the affection. The itching is often severe, particularly at night.

Tinea Trichophytina Unguium (*Onychomycosis, Ringworm of the Nails*).—Occasionally, the nails are invaded by the ringworm fungus. They become opaque, white, thickened, and soft or brittle. Two or three nails are usually affected. The disease runs a chronic course, and is refractory to treatment.

Pathology.—The fungus is found in the epidermis, particularly in the corneous layer. Mycelium is abundant, spores scanty. The former consists of long, slender, sharply contoured, bifurcated, jointed threads. The spores are rounded, highly refractive bodies, varying from 1/1000 to 1/600 inch in diameter.

Diagnosis.—Tinea circinata may be distinguished from eczema, psoriasis, and seborrhea by the superficial character of the lesions, their annular configuration, the history, the course, and, finally and conclusively, by the microscopic examination.

Method of Examining for the Fungus.—Epidermic scales are scraped off with a knife and placed on a microscopic slide with a drop of caustic potash (20 to 40 percent). A cover-glass is then applied, with sufficient pressure to flatten out the scales. The fungus is best studied with an oil-immersion lens, although it can be seen with the dry system.

Prognosis.—As a rule, the affection yields promptly to treatment. Tinea cruris is more rebellious than the ordinary form.

Treatment.—The treatment consists in the use of parasiticide ointments and lotions. Mercury, sulphur, beta-naphthol, resorcin, tar, and chrysarobin are all valuable. An efficient formula is:

℞. Ammoniated mercury, gr. xx to xl
Zinc oxid ointment, ℥ j.

Thiosulphate of sodium (1 dram to 1 ounce of water) and bichlorid of mercury (1 to 3 grains to 1 ounce of water) are useful applications, especially in tinea cruris.

RINGWORM OF THE SCALP (Tinea Tonsurans).—A contagious, vegetable, parasitic disease, characterized by circumscribed areas of partial baldness, with evidence of disease of the hairs.

Symptoms.—The disease begins with small, rounded, reddened scaly patches, occurring upon any portion of the hairy scalp. Soon the follicles become invaded and circumscribed hair-fall results. Typical lesions consist of partially bald, discrete, rounded, coin-sized, slightly reddened patches covered with grayish scales. The follicles are prominent, producing a "goose-flesh" appearance. The hairs are lusterless, and consist of "broken or gnawed-off stumps." They lie loosely in the follicles and are easily extracted.

In rare cases ringworm may affect the scalp diffusely, without the production of circumscribed patches (*disseminated ringworm*).

The only subjective symptom is itching, which is usually of a mild character. The disease occurs almost exclusively in children. In adults it is so rare as to constitute a dermatologic curiosity.

The course of the affection is extremely chronic. When cure results, full restoration of hair takes place.

Tinea kerion is a highly inflammatory ringworm terminating in suppuration. The patches are reddish or yellowish, raised, edematous, and boggy; they are honeycombed with distended openings of hair follicles, through which exudes a yellowish pus. Burning, itching, tenderness, and pain are present in a variable degree. The suppuration of a ringworm hastens its cure, but is apt to destroy the follicles and produce permanent baldness.

Etiology.—The cause of the disease is the trichophyton fungus or the microsporon audouini. Ringworm is essentially a disease of childhood. The affection is communicated from one child to another by means of caps, brushes, combs, towels, etc. It may also be contracted from the lower animals, such as the cat, dog, horse, or ox. Tinea circinata in the adult may produce tinea tonsurans in the child, and vice versa.

Pathology.—The fungus is found in the hair, the hair follicle, and the epidermis. In this form of the disease the spores are extremely abundant in the hair, producing under the microscope a fish-roe appearance. The mycelium is scanty or absent. The hair is prepared by immersion in liquor potassæ, and is examined without staining. Only broken-off hairs are to be selected for examination.

Diagnosis.—The characteristic features of tinea tonsurans are circumscribed patches of partial baldness, grayish scales, goose-flesh appearance, broken-off stumps of hair, and the presence of the fungus.

These points will enable one to distinguish the disease from eczema, psoriasis, and seborrhea. The differential diagnosis from alopecia areata is here appended:

TINEA TONSURANS.	ALOPECIA AREATA.
1. Slow and insidious onset.	1. Rapid onset.
2. Patches are	2. Patches are

Tinea Tonsurans.	Alopecia Areata.
(*a*) Covered with "broken-off stumps."	(*a*) Totally devoid of hair.
(*b*) More or less reddened.	(*b*) Pale and whitish.
(*c*) Rough and scaly.	(*c*) Smooth and soft.
(*d*) Follicles prominent; goose-flesh appearance.	(*d*) Follicles contracted.
3. Trichophyton fungus present.	3. Absence of fungus.
4. Occurs almost exclusively in children.	4. Common in adolescence and in adults.

Prognosis.—As to ultimate cure, favorale.b As to duration, guarded. Most cases persist from 6 months to 1 1/2 years.

Treatment.—The treatment consists of (1) daily soap and hot water cleansings; (2) epilation of diseased hairs; and (3) application of parasiticide ointments and lotions. The scalp will bear remedies of greater strength than the nonhairy surfaces.

The head should be washed vigorously each day with soap and hot water. For this purpose ordinary soap may be employed or, preferably, a soap containing tar. This accomplishes the double purpose of cleansing the scalp of fungus and scales and of preventing surface extension. The parasiticide effect of the washing may be increased by allowing the soapsuds to remain upon the scalp for from 15 to 20 minutes. The hair should be cut short in order to facilitate the application of the various medicaments.

The diseased hair should be extracted either with a broad-blade epilating forceps or the small end of a spoon and the thumb. Epilation is of value in effecting the removal of a considerable amount of fungus in the hair, in opening the follicle, and permitting the ingress of the parasiticide application.

The choice of the particular ointment or lotion is not a matter of great importance. It is the thorough and persevering use of the same that brings success. Sulphur, mercury, beta-naphthol, carbolic acid, resorcin, salicylic acid, tar, chrysarobin, and a host of remedies have been used, but those above mentioned are the most valuable. The following ointment will be found useful in most cases:'

℞.		
℞.	Precipitated sulphur,	ʒ j to ij
	Petrolatum,	℥ j.

This is to be rubbed into the patches vigorously once or twice a day. One may use, in conjunction, a lotion of sodium thiosulphate, one dram to the ounce. Beta-naphthol is a remedy of great value, and has the advantage of being free from odor:

℞.	Beta-naphthol,	ʒ j
	Petrolatum,	℥ j.

A lotion of the bichlorid of mercury may often be employed with advantage. Beginning with 1 grain to the ounce, one may gradually increase to 4 or 5 grains.

A word as to the prevention of the spreading of ringworm: Towels, brushes, combs, caps, soap, and other articles used by a ringworm patient should never be used by any one else. Physicians should prohibit children affected with tinea tonsurans from attending school until they are entirely cured. It is a great hardship upon a child to enforce its absence from school for a year or more, but it is the only method of stamping out this affection.

RISUS SARDONICUS.—A peculiar expression of the face, in which the features are distorted by spasm of the muscles so as to present the appearance of a painful grin or laugh. It is most usually observed in tetanus. After a full dose of strychnin (1/12 grain), among other symptoms, the face will take on an unmeaning smile, or risus sardonicus. The condition in itself is not to be treated, but its cause demands immediate removal.

RITTER'S DISEASE.—See Dermatitis Exfoliativa Neonatorum.

RODENT ULCER (Jacob's Ulcer; Cancroid Ulcer; Ulcus Exedens; Noli me Tangere).—A peculiar form of superficial epithelioma, almost invariably limited to the upper two-thirds of the face. It occurs in old age, and begins as a little nodule which ulcerates. The ulcer is round, oval, or irregular, with indurated everted edges and a smooth, glossy, pinkish surface; the discharge is slight, pain is absent, adjacent lymph glands are not involved, metastases do not occur, and the general health is unimpaired except in the later stages, death resulting from hemorrhage or from the local destruction of important organs. The disease progresses very slowly, sometimes lasting 30 or 40 years, and occasionally cicatrizes in spots, the scars later breaking down. The ulcer advances principally along the surface, although in the later stages it extends deeply and destroys everything in its path, including the bones. The disease may originate in any of the epidermal structures. See Epithelioma.

ROENTGEN RAYS.—The discovery by Prof. Roentgen of Wurtzburg of a new form of radiant energy emanating from a Crooke's tube has given rise to the new science of Roentgenology. He found that this new form of energy was capable of penetrating substances formerly considered opaque, in degrees varying with the vaccum in the tube and the density of the object penetrated.

It affected the silver salts of the photographic plate, and the fluorescent salts spread upon a screen called a fluoroscope with proportionate degrees of intensity and thus lent itself readily to use in diagnosis. He did not invent any apparatus, but showed that the rays he discovered could be applied to physical diagnosis.

Roentgenology is the application to diagnosis and therapy of the unknown (X) or Roentgen rays. This science is subdivided into (*a*) *Roentgenography*, physical diagnosis by means of these rays and the photographic plate, (*b*) *Roentgenoscopy*, their use with the fluoroscope, and (*c*) *Roentgenotherapy*, treatment by this form of irradiation.

The development of apparatus has rendered the rays more powerful and less dangerous to the patient in experienced hands, but more dangerous both to patient and operator in the hands of the inexperienced. Their use must therefore be confined to those who have acquired special knowledge, and only in such hands can valuable results be expected.

The Dangers of the Roentgen Rays.—The advancement in technic and apparatus practically limits the danger to those who have little or no experience. The increase in power, which makes diagnosis now possible by an exposure of only a few seconds, augments the danger in the hands of the inexperienced. Medical knowledge is essential to their valuable application in diagnosis and in therapy; it is needed to appreciate the change produced, and to regulate the dose accordingly.

The series of lamentable, often fatal, accidents to operators has shown the necessity for special training. Though the patient is less liable to injury from the more powerful apparatus, the danger to the untaught operator is greater.

The Apparatus.—The evolution of efficient apparatus has been rapid. The Ruhmkorff coil of the physical laboratory even when improved was crude and difficult to handle. The modern Roentgen generator is more powerful and yet simpler in manipulation. It is a machine, as simple to run as an ordinary electric motor, without the disadvantages and complications of inverse currents, electrolytic or mechanical interrupters, and the constant expense and annoyance attendant upon their regulation and repair. It furnishes an unlimited supply of unidirectional high-potential current necessary to energise the Roentgen tube. It is an efficient and easily controlled mechanism of great power.

The problem of effective technic has, however, become more rather than less complicated, since more efficient modifications in its application have been made, thus rendering diagnosis more accurate.

Such efficient apparatus can be run in connection with any commercial electric lighting or power circuit, but must be adapted to the particular current to be employed.

The Roentgen Tube.—This is a modified Crooke's tube adapted to the purposes of Roentgenology. It is now the most complicated part of the apparatus to understand and requires efficient technic. Since the rays emanating from the Roentgen tube in action vary with its vacuum in penetration and therapeutic value, they must be adapted to the particular form of diagnosis to be made and to the disease to be treated.

Other essential accessory pieces of apparatus have been developed, the *milliamperemeter* to measure the amount of current passing through the tube; the *static voltmeter* to measure the tension of the current and the relative vacuum of the tube, *i. e.*, the penetrating power of the rays while the tube is in operation; filters, which by removing undesired rays have increased the safety and efficiency of the rays in diagnosis and treatment.

These contrivances, while reducing the time of exposures in diagnosis from minutes to fractions of a second, have rendered technic essential and yet more involved.

In practice Roentgenology is divided into diagnosis and therapy.

Roentgenography is a method of physical diagnosis by means of the Roentgen rays and the photographic plate. A *Roentgenogram* is a photographic negative produced by this method upon which the Roentgen diagnosis is based. A Roentgenogram can be produced by any one who can run the apparatus, but one upon which a valuable diagnosis can be based can only be made by a medically educated operator knowing the essential special technic. For diagnostic purposes there is desired not a picture, but a Roentgenogram which shows the tissues in which a lesion is supposed to exist.

The value of the Roentgen diagnosis is dependent upon the medical training of the operator, his technical ability in employing this method and his clinical experience in translating the resulting data.

The tube must be placed in proper relation to the part to be examined and the photographic plate; the quality of rays must be adapted to the tissues to be studied; the exposure must be correct, in order to determine the presence or absence of the supposed pathologic lesion. Anatomical, clinical and special technical knowledge combined with experience are therefore essential to an accurate Roentgen diagnosis.

Stereoroentgenograms are pairs of Roentgenograms so made that when each is viewed by one eye of the observer in the stereoscope the effect of a true perspective is produced. By this method the distortion produced by the divergence of the rays emanating from the tube is corrected and transformed into a true perspective or a realization of the third dimension. It has the advantage of showing the lesion in its true anatomic relations, not as a shadow, but, as it were, within a semi-transparent body. Thus the position of the bones in dislocations, the fragments in fractures, the location of foreign bodies, or the minute masses of tubercle in tuberculosis of the lungs are seen in their true anatomic relations to the surrounding normal structures.

The development of more efficient apparatus has shortened the time of exposure, so that voluntarily movable organs can be shown in sharp detail after exposure of a fraction of a second in most examinations; while no exposure, except in very stout individuals, should exceed 15 to 20 seconds, unless taken with portable apparatus. The examination of patients in their homes is easy and practical, but necessitates less powerful apparatus and longer exposures.

Applications of Roentgenography.—In internal medicine it has rendered diagnosis more accurate by clearly demonstrating the size, position, and form of aneurysms, aortic dilatations, changes in the size and position of the heart, mediastinal new growths, and strictures and new growths of the esophagus. In the lungs it locates and shows all macroscopic, pathologic changes, while in tuberculosis of the lungs it definitely determines the presence, position and size of areas of congestion, consolidation, softening and cavity formation, as well as the effect of adhesions and contractions upon the mediastinal viscera and the diaphragm. Early enlargement of the peribronchial lymph nodes can be shown before they can be detected by physical signs, while stereoscopic pictures reveal minute clusters of tubercle scattered throughout the lung.

The application of this method to the stomach after a bismuth meal has been given, reveals its normal or pathologic position and the presence or absence of motor insufficiency, pyloric obstruction, malignant disease, pathologic stricture of the stomach and intestines, or ptosis of these organs.

In the kidney, enlargements, displacements, abscesses, new growths and calculus formations can be revealed by this method. In renal calculus it is admittedly the most accurate method known. It determines the size, position and number of the calculi present in the kidney, ureter, or bladder, and no surgical intervention or expectant treatment is sanctioned without its employment. The differentiation between sthenic and asthenic forms of arthritis is another very valuable aid to internal medicine.

In surgery it is of great value in locating foreign bodies, in definitely determining the lines of fracture, the position and number of the fragments, the efficiency of reduction and of fixation appliances. The same is true of dislocations, while its value in excluding such injuries should not be overlooked.

It differentiates between the several forms of bone disease, showing the location, extent, and nature of cysts, tuberculosis, osteomyelitis, syphilis, malignant diseases.

In orthopedic surgery it is peculiarly adapted to the determination of the extent, location and character of bone defects, distortions and necroses, differentiating, for example, between achondroplasia and osteomyelitis, and elucidating the extent and character of the deformity present. It detects supernumerary bones and shows congenital malformations, defects and dislocations.

In otology and rhinology it reveals disease of the accessory sinuses, and the presence of abscesses and bone absorption in the mastoid cells.

Medicolegal Value.—The Roentgen rays produce a visible picture of pathologic conditions which could formerly be expressed only in the mental pictures formed by other methods of physical diagnosis. In medicolegal testimony it has the advantage of being evidence which can be seen and the meaning of which can be demonstrated to a jury. The question of interpretation is the only one capable of argument, and for that reason it is essential that expert testimony should be on hand for both sides. when any question of interpretation can be raised. In the majority of cases, especially of bone injury, the interpretation is obvious. This method possesses an additional advantage in that it shows not only the present condition, but also the extent of the original injury—a point which should always be brought out in malpractice suits. Its power to demonstrate the absence of any bone injury is particularly valuable when such an injury is falsely made the basis of a suit for damages.

Since this method has been admitted to be of scientific value and permitted as evidence in courts of justice, its employment in all cases of fracture forms the greatest safeguard to the surgeon against suits for malpractice. It furnishes evidence of the condition before treatment, the seriousness of the bone lesion, and if plates are made after the fracture is set and immobilized, demonstrates that efficient treatment has been instituted. The inference that the injury to function is proportionate to the distortion shown in the Roentgenogram is erroneous, for bones united with apparent distortion are frequently found after injury in limbs that have perfect function. The fact that the injury to ligaments and soft tissues is not shown by the Roentgenogram should be made clear, although they may be inferred from the injury demonstrable. It is therefore obvious that the evidence produced by this method cannot form the basis for determining the amount of functional injury sustained by the patient.

Roentgenotherapy.—The treatment of disease by means of the irradiations from a Crooke's or Roentgen tube.

The therapeutic value of the Roentgen rays has been so clearly demonstrated that this department of Roentgenology is firmly established. Pathologic studies have demonstrated that the Roentgen rays have a destructive action upon all tissues of low vitality and hence upon all cells resulting from disease, at the same time stimulating normal cells to greater activity. Thus this agent increases the local resistance of the normal tissues while it devitalizes the pathologic. This local action on metabolism in a measure accounts for the many successful applications of this agent.

The effective application of the Roentgen rays for therapeutic purposes demands careful study and experience. By timidity in their application the diseased cells instead of being destroyed may be stimulated to greater activity. By too severe treatment the normal cells may be injured and the local vitality and resistance so essential to recovery may be destroyed. The difficulties attending the proper use of this method account for divergent reports of success and failure.

The results obtained show that Roentgenotherapy is effective in many serious and especially chronic conditions intractable to other methods.

The field of this therapeutic agent is so wide that only a summary of some of its successful applications can be given.

In malignant disease some remarkable results have been produced. It has cured many inoperable and hopeless cases, while as a palliative measure it is the most efficient in affording, when properly applied, relief from pain. As postoperative treatment, its beneficial effect in malignant cases is shown in the reduced mortality rate of such cases. These results have led to its application in the earlier stages of the disease with proportionately better results.

In epithelioma (*q. v.*) and rodent ulcer it has been shown by many series of permanent results to be superior to other methods of treatment.

In tuberculous cervical adenitis it can be employed efficiently in the early stages of disease, when consent to radical treatment cannot be obtained, and while the patient is under medical treatment.

Successful results have been obtained in cases of recurrence after repeated operations. It produces healing in persistent sinuses and ulcerations that have defied surgical treatment. In these conditions it is therefore the method of choice.

In lupus vulgaris and lupus erythematosus it is the most effective treatment known, and produces permanent results with less scar formation.

In other cutaneous lesions such as acne, eczema, pruritus, ringworm, sycosis, etc., the results are remarkable, especially in the chronic forms that have resisted all other medication; this is especially true of the indurated acne and dry eczemas.

It has also been found valuable in diseases such as the neuralgias and neuroses, goiter (both simple, and exophthalmic), as well as other conditions, affording, in many instances, relief from pain, and permanent cure. To obtain the best results, however, treatment should be instituted in the earliest stages of disease.

ROSE (Rosa).—Represented in official pharmacy by the petals of one species and the volatile oil from another.

Rosa Damascena, *Damask Rose,* is the source of the official oil of rose, which is distilled from the fresh flowers.

Rosa Gallica, *Red Rose,* is the petals of *Rosa gallica,* collected before expanding. They contain an aromatic oil, tannic and gallic acids, *quercitrin,* coloring matter, salts, etc.

Rose water has no strictly medical properties, but is an agreeable excipient for lotions, collyria, and urethral injections. The ointment, commonly termed *cold cream,* is a pleasant emollient and protective agent, generally used for chapped hands and other superficial skin affections. Red Rose is classed among the astringents, as it contains an appreciable amount of tannic and gallic acids. A compound infusion, containing sugar and dilute sulphuric acid, was formerly official, and is used as an agreeable gargle for the throat and mouth in inflamed and ulcerated conditions. The chief uses of the rose preparations are as vehicles for other agents, or to impart flavor and odor to extemporaneous prescriptions.

Preparations.—R. Oleum, *Attar of Rose,* is a volatile oil distilled from the fresh flowers of *Rosa damascena.* It is a pale-yellowish, transparent liquid, having a strong odor of rose, a sweetish taste and a slightly acid reaction, but slightly soluble in alcohol. It consists of an aromatic oxygenated elæopten and an odorless solid stearopten (rose-camphor). Being very expensive it is much adulterated with other volatile oils. It is used chiefly for perfuming cosmetic preparations, ointments and lotions, and as the basis of the following three preparations. **R. Aqua Fortior,** *Triple Rose Water,* is water saturated with the volatile oil of rose petals. An agreeable excipient and flavoring agent. Dose, 1/2 to 4 drams. **R. Aqua** consists of equal volumes of the preceding and distilled water, mixed together immediately before use. It is an ingredient of mistura ferri composita. Dose, 1 to 8 drams. **Unguentum Aquæ R.,** *Cold Cream,* has of stronger rose water 19, expressed oil of almond 56, spermaceti 12 1/2, white wax 12, and sodium borate 1/2. **Fluidextractum R.,** prepared from red rose with glycerin and diluted alcohol. Dose, 5 to 60 minims. **Confectio R.,** has of red rose 8, sugar 64, honey 12, stronger rose water 16, beaten together into a mass. Dose, 10 to 60 grains. **Mel. R.,** *Honey of Rose,* has of the fluidextract 12, and clarified honey to 100. Dose, 1 to 2 drams. **Syrupus R.,** has of the fluidextract 12 1/2 percent. Dose, 1 to 2 drams for flavoring. Red rose is an ingredient of Pil. Aloes et Mastiches. The confection is an ingredient of Pil. Aloes et Ferri.

ROSE COLD.—See Hay-fever.

ROSEMARY (Rosmarinus).—The leaves of *R. officinalis.* Its properties are due to a volatile oil and a resinous principle. Rosemary was formerly considered emmenagog, galactagog, and diuretic. It is chiefly used as an external stimulant in liniments and lotions, especially to the scalp, in alopecia (usually combined with cantharides). **R., Oleum,** the volatile oil. Dose, 1 to 5 minims.

ROSEOLA.—A rose rash. See Erythema, Rubella, Syphilis, Typhoid Fever, Vaccination.

ROSMARINUS.—See Rosemary.

ROUGH ON RATS.—A paste for poisoning rats, occasionally used as a means of suicide. The active ingredient in most of these pastes is arsenic, and acute arsenic-poisoning results from its ingestion. See Arsenic.

ROUND LIGAMENTS.—See Alexander's Operation.

ROUND-WORMS.—See Worms.

RUBEFACIENTS.—Substances that by irritation of the ends of the nerve filaments of the skin cause distention of the capillaries and reddening of the skin. If left too long in contact with the surface, exudation between the cuticle and true skin may ensue, when the agent becomes a vesicant; or it may destroy the tissue and form a slough, when it is an escharotic. Muscular atrophy may be induced by rubefacients. The following is a list: Mustard, capsicum, camphor, ammonia, mezereon, arnica, alcohol, ether, chloroform, iodin, menthol, oil of cajuput, oil of turpentine, volatile oils, pitch, friction, and hot water. See Counterirritation.

RUBELLA (Rötheln; German Measles; Roseola).—An acute infectious disease of a mild nature, and characterized by slight inflammation of the mucous membrane of the conjunctiva, mouth, nose, and fauces; enlargement of the cervical glands; mild fever, and a papular eruption of the skin.

Etiology.—Rubella is contagious, and may occur in epidemics or sporadically. Though probably microbic in origin, the specific organism has not been isolated. It is spread by the cutaneous exhalations and breath and by fomites, especially in hospitals or crowded quarters; it is very contagious, but in family practice it is but slightly so, the cases often being confined to a single household. The incubation period is from 10 to 12 days, though it may vary; but as a rule it is longer than in measles.

The stage of invasion is from 1 to 3 days, but in mild cases the appearance of the rash may be the first indication of the disease.

Symptoms.—Usually for a period of a few days before the rash appears there will be chilliness, pain in the legs and back, a dull heavy feeling, and perhaps slight fever. There may be suffusion of the eyes and coryza. Enlargement of the tonsils and of the cervical lymph-glands are common.

Just before or with the appearance of the rash there is a rise in temperature—99° to 100° F., or in severe cases 102° to 103° F. These symptoms in certain cases may be very mild or altogether wanting, the appearance of the rash, as stated, being the first sign of infection. The rash first appears on the face and extends downward over the body. In some cases, however, only one part of the body may show any eruption; in others every part, including the palms of the hands and soles of the feet, may be covered. The roof of the mouth and fauces usually are more or less generally covered with the rash.

The eruption is multiform, confluent, and of a pale or rosy red color. The patches do not have any regular shape or form, and the skin between them may be hyperemic and itching. It reaches its height on different parts of the body in succession, fading in one part while appearing in another. The duration of the rash is from 2 to 5 days. Slight branny desquamation usually appears. A slight brownish pigmentation often follows the rash, but disappears in a few days.

The temperature varies, but usually there is fever—100° to 102° F.—while the eruption is at its height.

Sore throat of greater or less severity is usually present, as is also a dry bronchial cough. In severe cases vomiting may occur during the eruptive period, but, as a rule, the constitutional effects are very slight, the patient with difficulty being kept in bed. The duration is 3 days to a week; when uncomplicated, the convalescence is rapid. The complications that may occur are severe bronchitis, pneumonia, and gastrointestinal catarrh; but they are not frequent, most children escaping any serious consequences of the affection.

Diagnosis.—In sporadic cases there is no rule by which rubella may positively be distinguished from measles, or in certain cases from mild scarlatina.

The milder onset, the character of the eruption, and mild symptoms throughout, with the absence of complications and sequels, will, however, serve to differentiate it from a well-marked case of either of these diseases, with their characteristic onset, rash, and course. The eruption does not last so long as that of measles. There is more distinct mottling than in scarlatina.

The following table will be a guide in distinguishing rubella from erythema and urticaria:

RUBELLA.	ERYTHEMA.	URTICARIA.
Rash occurs first on face.	On hands and feet.	In wheals on arms and legs.
Coryza..........	None............	None.
No itching at first.	Burning pain.....	Intense itching.
Contagious........	Not so...........	Not so.
Microbic origin....	Reflex origin......	Gastric origin.

The **prognosis** in uncomplicated cases or except when occurring in children weak and debilitated from other causes, is invariably favorable.

Treatment.—The child should be confined to a room with a temperature from 68° to 70° F., and when feverish kept in bed. A daily warm bath or warm sponging, followed by inunctions of cacao-butter, should be given, and the bowels kept open with small doses of calomel, to which, when there are fever and restlessness, should be added phenacetin or acetanilid, 1/2 grain for each year of the child's age, every 3 hours. When there is coryza or sore throat, the patient should be treated with a mild alkaline wash, and for the cough, when present, a mixture as given for measles should be prescribed. The child should be isolated for a period of at least 2 weeks.

RUBEOLA.—See MEASLES.

RUBUS (Blackberry).—It contains more than 10 percent of tannic acid. It is very astringent, and is highly esteemed in summer and infantile diarrheas. Dose, 10 to 30 grains. **R. Fluidextractum.** Dose, 10 to 30 minims. **R. Syrupus.** Dose, 1/2 to 2 drams.

RUMINATION (Merycism).—A remarkable and rare condition in which patients regurgitate and chew the cud, like ruminants. It occurs in neurasthenic or hysteric persons, epileptics, and idiots. It may be hereditary. Certain persons have the power of returning food from the stomach to the mouth at will.

In several instances recorded the return of the food took place in about 15 minutes after finishing the meal, and usually had no acid taste, and had not undergone any digestion. The medical treatment of the condition consists in the use of ipecacuanha and aloes twice daily, and administration of a tonic before meals.

RUPIA.—A term used to denote a peculiar variety of pustular syphiloderm. See SYPHILIS.

RUPTURE OF UTERUS.—See POSTPARTUM HEMORRHAGE.

RYE.—See ERGOT.

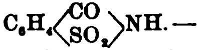
S

SABAL.—The fruit of *Serenoa serrulata*, the saw-palmetto. Sabal is sedative, nutritive, tonic and diuretic. It has been used with much benefit in the enuresis of old men, enlargement of the tonsils, spasmodic croup, chronic sore throat, and gonorrhea. The elixir saw-palmetto and santal compound is highly esteemed in incontinence of urine, vesical catarrh, and urethritis. Dose of the fluidextract, 1 dram.

SABINA.—See SAVINE.

SABROMIN.—Dibrombehenate of calcium. It has the same action as the bromids, but its effect is less rapid and more prolonged. It is said to be free from the disadvantages of the bromids. Dose the same as that of potassium bromid.

SACCHARATE.—Compound of saccharic acid and a base, or compounds of cane-sugar with a base. **S. of Iron** (ferrum oxydatum saccharatum solubile, Ger. Ph.), a compound of cane-sugar and iron, important as an antidote for arsenic. **S. of Lead,** a salt of saccharic acid and lead, used in forming the nitrosaccharate of lead, which has been vaunted as a safe and effective solvent for urinary calculus. **S. of Lime,** a compound of cane-sugar with lime. A syrup charged with it has been recommended as a cure for chronic rheumatism. A solution of this compound is a good antidote in carbolic acid poisoning. **Saccharated Carbonate of Iron,** a greenish-gray powder containing sulphate of iron. **S. Iodid of Iron,** iodid of iron with milk-sugar. **S. Pepsin,** milk-sugar with pepsin from the stomach of the hog.

SACCHARIN. 
$C_6H_4\left\langle\begin{matrix}CO\\SO_2\end{matrix}\right\rangle NH$.—Benzosulphinid, derived from coal-tar, occurring as six-sided, colorless tablets, melting at 224° C. It is 280 times sweeter than cane-sugar. It is used as a substitute for sugar in diabetes, and is recommended for use in the treatment of corpulency and gout. It is also antiseptic, and has been found useful in erysipelas, septic fever, and gonorrhea. Dose, 1/2 to 5 grains.

SAFFRON.—See COLCHICUM.

SAFROL. $C_{10}H_{10}O_2$.—The methylene ether of allyl pyrocatechol, found in oil of sassafras and other oils. It is used in headache, neuralgia, and subacute rheumatism. Dose, 1 to 10 minims. It is also employed for perfuming soap.

SAINT VITUS' DANCE.—See CHOREA.

SAJODIN.—Monoiodobehenate of calcium. A substitute for the iodids. Although containing a smaller quantity of iodin than potassium iodid, sajodin is claimed to be equally efficient. It is said to have been proven exceptionally free from the unpleasant and deleterious by-effects of the iodids. It is used for the same purposes as potassium iodid. Dose, 15 to 45 grains daily.

SALICIN.—A glucosid occurring in the bark and leaves of willows and some poplars. It forms shining crystals that dissolve easily in hot water and alcohol, and melt at 198° C. Its taste is bitter. It possesses tonic properties, and is used as a substitute for salicylic acid in the treatment of rheumatism. Dose, 10 to 30 grains.

SALICYLIC ACID. $C_7H_6O_3$.—Orthooxybenzoic acid; occurs in a free condition in the buds of *Spiræa ulmaria*, in the oil of wintergreen, and in other varieties of gaultheria. It is also obtained synthetically. It consists of four-sided prisms, and crystallizes readily from hot water in long needles. Is soluble in water, and very soluble in chloroform; melts at 155° to 156° F. It is a powerful antiseptic and is used as such in surgery and dermatology in solution and ointment. It is much used in the treatment of acute articular rheumatism and myalgia. Dose, 5 to 15 grains.

Lithii Salicylas, a white, or grayish-white powder, odorless, sweetish, very soluble in water and in alcohol. Dose, 5 to 30 grains. **Sodii Salicylas,** a white, amorphous powder soluble in 3/4 of water and in 6 of alcohol, also in glycerin. Dose, 5 to 30 grains. **Strontii Salicylas,** a white, crystalline powder, soluble in 18 of water and in 66 of alcohol. Dose, 5 to 30 grains. **Methylis Salicylas,** *artificial oil of wintergreen,* is an ester, produced synthetically; and is the principal constituent of oil of gaultheria and oil of betula. It is soluble in all proportions in alcohol or glacial acetic acid. Dose, 5 to 30 minims, suspended in sugared water. **Phenylis Salicylas,** *salol,* is the salicylic ester of phenyl, and occurs as a white, crystalline powder, odorless and almost tasteless, nearly insoluble in water, soluble in 10 of alcohol, and very soluble in ether, chloroform and oils. On being warmed with an alkali it splits up into salicylic acid 60, and phenol 40. Dose, 5 to 15 grains, frequently repeated, in compressed tablets or in cachets, or suspended by mucilage of acacia or of tragacanth. See SALOL. **Physostigminæ Salicylas.** See PHYSOSTIGMA. **Oleum Betulæ,** *oil of sweet birch,* is a volatile oil distilled from the bark of *Betula lenta,* the sweet birch. It is identical with methyl salicylate and nearly identical with oil of gaultheria. Dose, 5 to 30 minims. **Oleum Gaultheriæ,** *oil of wintergreen,* consists almost entirely of methyl salicylate, and is nearly identical with the preceding. See GAULTHERIA.

Sodium Salicylate is more soluble than the acid and less irritant to the stomach, while in doses about 50 percent larger it is equally efficient. It is employed in 3- to 5-grain doses internally after meals, to arrest gastric fermentation and to prevent acidity and flatulence. It is used instead of the acid in acute inflammatory rheumatism, muscular rheumatism, phlebitis, rheumatic neuritis and other irregular forms of rheumatism, with immediate benefit in most cases, and it sometimes gives temporary relief in chronic rheumatism. In gout and its manifestations, especially migraine and sciatica, it frequently proves highly effective; and it has been used with satisfaction in cases showing a tendency to the formation of gall-stones. It is useful in the glycosuria of gouty subjects, and in the nervous irritability of lithemic persons. It is ranked as almost specific in pneumonia by many practitioners, and is very efficient in non-syphilitic inflammations of the eyeball, whether rheumatic or not, especially interstitial keratitis, if given in large doses. It is highly efficient in quinsy, and has been commended as an alterative diuretic for the removal of serous pleuritic effusions. When large doses are prescribed the patient should be kept in bed, and brandy, strychnin, and digitalis should be administered to counteract its depressant action. The salicylates are contraindicated in meningeal inflammation or congestion, middle ear disease, renal insufficiency, albuminuria, and nephritis.

Lithium Salicylate is believed to be particularly applicable in lithemia, gout, rheumatic arthritis, and the various manifestations of the uric acid diathesis.

Strontium Salicylate is not apt to derange the stomach, but is too slow in its action to be of value when a rapid and powerful influence is desired. In 5-grain doses it is one of the best intestinal antiseptics, giving better results than salol or naphthalene. In 10- to 15-grain doses it is one of the most efficient salicylates for chronic gout and lithemia with intestinal indigestion (Wood).

SALIFORMIN (Urotropin Salicylate).—Saliformin is a genitourinary antiseptic and is recommended as a uric-acid solvent. Its action is similar to that of a mixture of hexamethylenamin and salicylic acid, for it is largely hydrolysed into its constituents in the presence of water. Dose, 5 to 30 grains.

SALINE INFUSION.—See Infusion of Salines.

SALINES.—See Cathartics, Mineral Waters.

SALIPYRIN.—A white powder, the salicylate of antipyrin, consisting of 57.7 parts of salicylic acid and 42.3 parts of antipyrin. It is readily soluble in water and has been recommended as an analgesic and antipyretic in doses of 10 to 20 grains.

SALIVATION.—An excessive secretion of saliva. It may be produced by certain poisons, by such drugs as mercury and pilocarpin, or by nervous disturbances. See Mercury (Poisoning), Sialagogs.

SALOL (Phenyl Salicylate). $C_{13}H_{10}O_3$.—A white, odorless, crystalline substance. It is used as an intestinal antiseptic and as a substitute for salicylic acid, being less irritating to the stomach. Dose, 5 to 15 grains. It is decomposed in the intestines into salicylic acid and phenol. On this account it has been employed to test the motor power of the stomach. A few grains are given in capsule and the urine is tested at intervals for the decomposition products of salicylic acid.

Salol is one of the most efficient remedies for duodenal catarrh, catarrh of the bile-ducts, and catarrhal jaundice; also in the bilious form of sick headache, and in some forms of neuralgia. It is a remedy of very great value in typhoid fever; disinfecting the ulcerated intestines, it promotes the healing process therein and hinders reinfection. It is highly recommended in dysentery, in cholera, and in infantile diarrhea. Given in the latter affection, a dark staining of the child's diapers is often noticed, which is due to the development of carbolic acid from the remedy. Its greatest power is manifested over acute rheumatism, in which disease many clinicians maintain that it has no superior, if given in 15- to 30-grain doses, up to 2 drams in the 24 hours, and continued for some time after the acute symptoms have subsided. In large doses, however, it is liable to induce symptoms of carbolic acid poisoning, which may be met by administering sodium sulphate or any other sulphate. It proves to be an efficient disinfectant in catarrh of the bladder, its constituents being excreted with the urine, and coming in contact with the vesical mucous membrane for a considerable length of time. It is much quicker in its action upon the urine than ammonium benzoate, as in a day or two, ordinarily, the urine loses its foul odor and alkalinity and becomes clear.

Externally, it is employed as an antiseptic and deodorant powder, against impetigo, eczema, sycosis, and other skin-diseases; and has done good service as an insufflation in the treatment of ozena. In spirituous solutions (5 percent) it is used with various flavoring agents in the preparation of mouth-washes and dentifrices; and it also enters into the composition of soaps, face powders, and other toilet articles.

In cholera morbus:

℞.	Salol,	ʒ j
	Bismuth subnitrate,	ʒ ij
	Chalk-mixture, add enough to make	℥ iij.

Two teaspoonfuls every 2 hours.

SALOPHEN.—A derivative of salicylic acid, occurring as minute, white, crystalline scales, odorless and tasteless, insoluble in water, but soluble in alcohol. It is decomposed by alkalies. The actions of salophen resemble those of phenyl salicylate (salol). It is not changed in the stomach, but is broken up in the intestine, liberating salicylic acid and acetylparamidophenol, which is not toxic. Its dose is 5 to 15 grains up to 1 or 1 1/2 drams in 24 hours. It is used as a substitute for salol, than which it is said to be far less poisonous. It can be very effectually combined with phenacetin in the treatment of neuralgia. In long-standing sciatica a 10 percent solution hypodermically into the gluteal muscles has given good results. It has been employed with decided benefit in intestinal dyspepsia with flatulence. See Salol.

SALOQUININ.—(Salochinin.) The salicylic ester of quinin. It is a tasteless, crystalline powder, insoluble in water. It is said to possess the virtues of quinin as well as those of salicylic acid, and is used efficiently as an antipyretic and antineuralgic. Dose, 5 to 30 grains.

SALPINGITIS.—See Fallopian Tubes (Inflammation).

SALTATORY SPASM.—See Nervous Diseases (Examination).

SALTPETER.—Native potassium nitrate. It occurs in colorless, hard, rhombic prisms of sharp, saline, and bitter taste, and is soluble in about 9.5 of water at 59° F., or in 4 of boiling water, but is insoluble in alcohol. The dose is from 20 grains to 1/2 dram, well diluted. It is a refrigerant diaphoretic and diuretic in febrile and inflammatory affections, especially of the trachea and bronchi. It is useful in asthma, pneumonia, and rheumatism.

The fumes of the following burning niter paper are serviceable in spasmodic asthma:

℞.	Potassium nitrate,	2 1/2 parts
	Powdered belladonna leaves,	1/2 part
	Powdered stramonium leaves,	5 parts
	White sugar, pulverized,	1/2 part.

Dissolve the niter in just enough water to make a saturated solution, mix with the leaves, dry into a coarse powder, and add the sugar. A small quantity is to be placed on a tin plate, ignited, and the smoke inhaled.

Poisoning.—There is no chemic antidote. Emetics or stomach-pump, demulcent drinks, and emollient enemata, particularly milk, should be administered. Opium is the best antagonist for the subsequent depression. Aromatics and brandy may be given. See Potassium.

SALT RHEUM.—See Eczema.

SALVARSAN.—See Syphilis.

SANDALWOOD (Santalum).—The wood of a species of *Santalum album* and *S. citrinum*, or yellow sandalwood. It yields oil of santal, an astringent oil, useful in chronic bronchitis and gonorrhea. It is often adulterated with oil of cedar. Dose of the **volatile oil**, 5 to 15 minims, in emulsion or capsule. *S. rubrum*, red saunders, the wood of *Pterocarpus santolinus*, imparts a brilliant red color to ether and alcohol.

SANGUINARIA (Blood-root).—The dried rhizome of *S. canadensis*. It contains the alkaloids sanguinarin, chelerythrin, protopin, and homochelidonin. Dose of the powdered root as an expectorant, 1 to 5 grains; as an emetic, 10 to 30 grains; best given in pill. In large doses it causes vomiting and purging. Toxic doses cause convulsions, and then paralysis; death results from failure of respiration. As a stomachic and hepatic stimulant it is employed in small doses (3 drops of the tincture). It is used as an expectorant in chronic bronchitis. Chronic nasal catarrh, asthma, and acute bronchitis are remarkably amenable to the influence of sanguinaria, particularly when it is given in 10-drop doses of the tincture. It is used as a specific emetic in croup, though its action is uncertain and harsh. It is incompatible with alkalies, tannin, and most of the metallic salts. Its antagonists are amyl nitrite, opium, atropin, and such drugs as antagonize the depression of the circulation and the local irritant action.

Preparations. Fluidextract.—Dose, 1 to 5 minims as an expectorant; 10 to 60 minims as an emetic (cautiously). S., Tinct., 10 percent strong. Dose, 5 to 30 minims as an expectorant; 1 to 3 drams as an emetic. **Sanguinarin, the alkaloid,** unof. Dose, 1/12 to 1/8 grain; as an emetic, 1/2 to 1 grain.

SANOSE.—An albumin preparation, stated to consist of 80 percent of casein and 20 percent of albumose. It is a white, odorless, and tasteless powder, which readily forms emulsions with water. It is used as a food and tonic, preferably in form of emulsion.

SANTALUM.—See Sandalwood.

SANTONICA (Levant Wormseed).—The flower heads of *Artemisia pauciflora*, the properties of which are due to a crystalline principle, santonin The flower heads yield about 2 percent of santonin, which is a very efficient anthelmintic against the round-worm, Ascaris lumbricoides. Dose, 1/4 to 2 grains. The tape-worm is not affected by santonin. Santonin should be given, as are all vermifuges, with preceding catharsis and starvation. Sodium santoninate should not be used, as it is absorbed by the system rather than by the intestinal parasite. The crystals of santonin rather than the powder should be employed. A saline purge should be given, preferably followed in a half-hour by a 2- or 3-grain dose of calomel, if no bowel movement has occurred within 10 hours after taking the santonin.

℞.	Santonin,	gr. v
	Powdered white sugar,	ʒ iij
	Powdered acacia,	gr. viij.
	Mix well and add:	
	Mucilage of acacia,	gtt. xvj
	Water, sufficient quantity.	

Make into 10 troches. Give 1 or 2 as directed.

See Anthelmintics.

In large doses it produces yellow vision and gives a yellow color to the urine. In toxic doses it causes headache, vertigo, sometimes convulsions, and death by respiratory paralysis. **Santonini, Troch.**, each contains 1/2 of a grain of the active principle. Dose, 1 to 5.

SAPO.—See Soap.

SAPREMIA.—See Sepsis.

SARCINA.—A genus of Schizomycetes, or bacteria, having spheric or ovoid cells dividing in three directions, thus producing cubic masses of greater or less size. See Bacteriology.

SARCOMA.—A connective-tissue tumor in which the cells so predominate in number, and often in size, that the intercellular substance becomes a secondary element. It may also be defined as a tumor made up of embryonal connective tissue. Sarcomata are malignant tumors, the small-celled forms and those of soft consistency excelling in this respect. They appear, as a rule, at an earlier age than carcinoma. The problem of their causation is not solved: in many instances it is possible to trace a history of injury. It is probable, however, that the trauma merely acts as a predisposing cause. To the naked eye sarcoma appears, as the etymology of the word indicates, flesh-like. Microscopically, the picture varies with the variety of tumor, whether it is a round-cell, a spindle-cell, or a giant-cell sarcoma, or one of the other derivative forms. Sarcomata are well supplied with blood, which, however, is not contained in true vessels, but in spaces lined by endothelium. They are often combined with other new growths, especially with the so-called mixed tumors and with certain congenital neoplasms, as the rhabdomyoma. The most frequent seats of sarcoma are the connective tissue of the skin, periosteum, intermuscular septa, tendons, subserous connective tissue, and the eye.

Treatment.—Operable growths should be early and thoroughly excised. Inoperable growths have been treated by inoculations with the streptococcus of erysipelas by reason of the fact that an attack of erysipelas sometimes has effected a cure. Recently a number of inoperable cases have been decidedly benefited by injections of Coley's fluid (a sterilized culture of the streptococcus of erysipelas and the bacillus prodigiosus). The initial dose is 1/2 minim injected into or around the tumor; the dose is gradually increased until there is a reaction of 101° to 103° F., then repeated every 2 to 3 days. If after 3 weeks no improvement results, treatment should be stopped. The X-rays have proved curative in a number of cases of sarcoma. See CARCINOMA, TUMORS, BONE (Diseases).

SARSAPARILLA.—The dried root of *Smilax medica,* and several other species of the smilax family, native to tropical America. It contains an essential oil and several extractive principles, and is diuretic, tonic, and alterative. It has mild alterative properties and is a good vehicle for potassium iodid. It is used somewhat in tertiary syphilis, scrofula, and similar diseases.

Preparations. **Fluidextractum S.**—Dose, 20 to 60 minims. **Fluidextractum S. Compositum** has of sarsaparilla 75, glycyrrhiza 12, sassafras 10, mezereum 3, glycerin 10, diluted alcohol to 100. Dose, 20 to 60 minims. **Syrupus S. Compositus** has of the fluidextract 20, fluidextract of glycyrrhiza 1·1/2, fluidextract of senna 1 1/2, sugar 65, oils of sassafras, anise and gaultheria, each 0.02, water to 100. Dose, 1 to 8 drams.

SASSAFRAS.—The root bark of *S. variifolium.* Its properties are due to a volatile oil. It is aromatic and a stimulant diaphoretic. **S. Oil,** the volatile oil. Dose, 1 to 4 minims. **Mucilago S. medullæ.** Dose, about 4 drams.

SATURNISM.—See LEAD (Poisoning).

SAVINE (Sabina).—The tops of *Juniperus sabina,* its properties are mainly due to a volatile oil which resembles turpentine, but is more irritant. Dose, 5 to 10 grains. In large doses it produces violent purging and vomiting. It is used as an emmenagog. Externally, it is useful to prolong the discharge from blisters and to stimulate ulcers to cicatrization. S., **Fluidextract.** Dose, 2 to 10 minims. **S., Ol.,** the volatile oil. Dose, 1 to 2 minims.

In amenorrhea:

℞.	Oil of savine,	♏ viij
	Mucilage of acacia,	℥ j
	Camphor water,	℥ iij.

Two tablespoonfuls 3 times daily.

SAW-PALMETTO.—See SABAL.

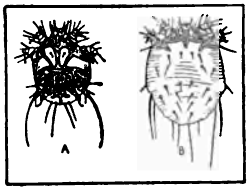
SCABIES (Itch).—A contagious, animal, parasitic disease due to the sarcoptes scabiei (acarus scabiei), characterized by burrows and a multiform eruption, and attended by severe itching.

Symptoms.—The itch-mite in burrowing into the skin produces at the point of entrance a small papule, vesicle, or pustule. Later, a burrow or cuniculus is formed at this site. The burrow is a straight, tortuous or zigzag, grayish or blackish, linear, epidermal elevation, varying in length from 1/8 to 1/2 inch.

In a well-marked case of itch there may be seen, in addition to the burrows, a multiform eruption consisting of papules, vesicles, pustules, crusts, excoriations (scratch marks), and thickening, occupying certain definite regions where the skin is thin; these are the interdigital spaces, the flexor surface of the wrist and arm, the anterior and posterior axillary folds, the breasts and nipples (in women), the umbilicus, the buttocks, the penis, the inner side of the thighs and legs, and the toes (particularly in infants). The face is exempt except occasionally in infants.

The eruption is attended by intense itching, which is distinctly worse at night. The irresistible scratching leads to the production of the secondary inflammatory symptoms. In children and individuals with sensitive skin the eruption may reach a high grade of inflammation. In predisposed subjects an eczema may be superadded to the scabies. The disease develops rapidly in the course of from 1 to 2 weeks. It is progressive, exhibiting no tendency to spontaneous cure. In untreated cases it may last many months.

Etiology.—The disease is due to the invasion of the skin by the sarcoptes or acarus scabiei. It is highly contagious. The disease may be transmitted by direct bodily contact or through the intermediation of such articles as the bedclothes. It occurs at any age, and is particularly common among the lower classes.



SARCOPTES SCABIEI. *A.* Male. *B.* Female.—(*Braun.*)

Pathology.—The burrow consists of a narrow tract through the epidermis made by the penetration of the impregnated female acarus. The mite deposits a half dozen or more eggs and specks of excrement along the course of the tract, and, after reaching the mucous layer, perishes. The ova hatch out in 8 or 10 days and, effecting their egress from the burrow, start cuniculi of their own. The itch-mite is a yellowish-white ovoid body, just visible to the eye. The female is twice the size of the male.

Diagnosis.—Scabies consists of the burrows plus an artificial inflammation of the skin, produced by the parasite and by the scratching. The characteristic features of the disease are the presence of the burrows, a multiform eruption distributed in a peculiar manner over the surface of the body, the intense itching—worse at night—and the history.

Scabies may be distinguished from vesicular or pustular eczema by the presence of the mite and the burrows, the peculiar distribution of the lesions, the progression of the eruption from day to day, and the history of contagion. From pediculosis corporis the disease may be differentiated by the character of the eruption and the regions affected.

Prognosis is favorable. The disease, no matter of what duration, is speedily curable.

Treatment.—The objects of treatment are twofold—to kill the parasite and to subdue the accompanying dermatitis. The itch-mite is easily destroyed by such remedies as sulphur, beta-naphthol, balsam of Peru, styrax, tar, staphisagria, etc.

Sulphur is one of the most reliable remedies, and is best applied in ointment form. It may be used in conjunction with balsam of Peru, as in the following formula:

For adults or those of nonirritable skin:

℞.	Precipitated sulphur,	℥ j
	Balsam of Peru,	℥ ss
	Beta-naphthol,	ʒ ij
	Lard, Petrolatum, } each,	℥ iv.

Make into an ointment.

Beta-naphthol possesses the advantage of being free from odor and more cleanly. It may be used alone (1 dram to 1 ounce) or combined with sulphur.

Styrax is less irritating than sulphur, and is useful in the itch of children:

℞.	Styrax,	℥ ss
	Lard,	℥ jss.

The treatment should be inaugurated by a protracted hot bath, with the vigorous use of soap. The body from neck to feet is then to be thoroughly smeared with the ointment. This may be rubbed in twice a day for 3 days, or nightly for 1 week. At the end of this time another bath should be taken, and the underclothing and bed-linen changed and sterilized. Ordinarily, such treatment will suffice to produce a cure; occasionally, it must be repeated.

Care should be exercised not to *overtreat* cases. The persistence of itching is not always an index of the continuance of the scabies, but is more likely to result from the dermatitis, which is, perhaps, aggravated by the parasiticide application. In such a case a sedative ointment or lotion should be substituted.

SCALDS.—See Burns.

SCALP, DISEASES.—**Abscess** may occur above the aponeurosis, between the aponeurosis and the pericranium, or beneath the pericranium. It is generally the result of an injury, but may be due to the breaking down of a gumma, diseases of the bones, etc.

Cellulitis of the scalp is usually due to a wound, and is described under Scalp (Injuries) (*q. v.*).

Erysipelas of the scalp is common, and may occur idiopathically or as the result of a wound. In the so-called idiopathic cases, however, it is probable that there is generally some scratch or abrasion through which the specific micrococcus gains admission. The inflammation spreads with great rapidity, but is accompanied by very little redness and swelling on account of the tenseness of the parts. It is likely to be attended with headache, drowsiness, or delirium, consequent upon the hyperemia extending to the pia mater. See Erysipelas.

Nævi are also common on the scalp. When large and situated over the anterior fontanel, they should be dealt with cautiously, lest the membranes of the brain are injured and meningitis results.

Rodent ulcer and **epithelioma of the scalp** require no special mention here.

Sebaceous cysts are very common on the scalp, where they are at times hereditary. They are frequently multiple, and as they increase in size the hair covering them falls off, and they appear as bare, rounded tumors. The mass of granulations which sometimes protrudes from the walls of these cysts (*fungating ulcer of the scalp*) closely resembles epithelioma, from which, however, it may generally be distinguished by the absence of induration and glandular enlargement, and by the history of a sebaceous cyst having been previously present. Congenital and dermoid cysts are met with.

Seborrhea.—See Alopecia, Seborrhea.

SCALP, INJURIES.—The scalp presents certain anatomic features of considerable surgical importance. The skin in the first place is so closely bound down to the aponeurosis beneath that mere cutaneous wounds never gape, and superficial inflammation is never attended by much swelling or redness. For the same reason contusions often cause what apparently are incised wounds. Further, the chief vessels lie between the aponeurosis and the skin, and are embedded in such dense tissue that when they are cut they cannot retract, and can hardly be tied. On the other hand, beneath the aponeurosis the tissue is so loose that blood or pus may collect until the skin floats as on a water-bed, bounded by the zygoma, the eyebrows, and the superior curved line; and the scalp can be stripped off and hang in flaps. Sloughing, however, owing to the position of the vessels, is rarely caused in this way. Finally, the pericranium is easily separated from the bone, except at the sutures; it only supplies the outer table, not the diploe or the inner, so that when necrosis occurs from this cause, the sequestrum is usually superficial. It is peculiar also that it seldom produces any new bone to repair an injury.

Contusions.—The blood may be extravasated (1) in the scalp itself; (2) in the subaponeurotic layer, or (3) between the pericranium and the bone.

The first, owing to the denseness of the tissue, is always insignificant. The second may be either diffuse and of enormous extent, or circumscribed, and then very often it is curiously deceptive. The blood around the margin coagulates into a hard, dense ring, the inner edge of which is sharp and well defined, while the outer is beveled off; in the center it remains fluid, so that when the finger is pressed upon it the margin stands out as clearly as the edge of a depressed fracture, for which it may easily be mistaken. The ring, however, is distinctly raised above the level of the surrounding bone, and it can always be indented. Abscesses sometimes give rise to the same kind of impression, and it must be remembered that the presence of a hematoma does not exclude the existence of a fracture.

The third (**cephalhematoma**) only occurs in infants, and nearly always from injuries received at birth. It is most common on the parietal bone —though it has been seen on the occipital—and is easily recognized by the way in which it is limited to one bone; it never extends over the sutures. Like the former, the margin becomes hard, and a certain amount of organization, and even ossification, takes place; the center remains fluid, and for a long time gives rise to a sensation of parchment crackling when pressed upon. Absorption in all these cases is slow; but, unless inflammation sets in, they should never be incised, and aspiration is rarely necessary. The cephalhematoma of infants should not be operated upon; in other cases lead lotion may be applied at first, or, if the patient will lie down, an ice-bag, to check the extravasation and hyperemia; afterward, well-applied pressure is the most efficient remedy.

Wounds.—These, like contusions, may be superficial, involving the skin only; or extend into the subaponeurotic layer; or lay the bone bare. The first are rarely of any extent; in the second, if the hair is entangled in machinery, or the head caught under a cartwheel, the whole scalp may be detached and hang down in a flap, but it rarely sloughs; in the third, there is an additional danger, for the bone is exposed, and is often bruised or scratched. Hemorrhage from the torn vessels is often abundant, but neither ligation nor torsion is of any use. Pressure stops it at once. Acupressure may be used, but a bandage is nearly always sufficient; care, however, is necessary, as it may be applied so tightly as to cause a slough.

Treatment.—Scalp wounds require no special treatment: the same principles must be followed as elsewhere; the only peculiarities are the extraordinary vitality of the skin, and the ease with which inflammation, if it once occurs, spreads in all directions. Therefore no portion of the scalp should ever be sacrificed, no matter how bruised or dirty it is; and perfect cleanliness and perfect drainage must be insisted on. If this is carried out, they may be treated like other wounds, and with exceptional success.

The head must be shaved about the injury, the wound carefully explored, washed out thoroughly with an antiseptic, all oozing stopped, and any bagging or collecting of fluid prevented. Counter-openings may be made and drainage-tubes inserted, if there is a dependent pouch; but in most cases it is sufficient to support the skin well against the skull so as to keep it at rest and insure early adhesion. Then the edges of the wound may be dusted over with iodoform and covered with an absorbent dressing, such as wood-wool, or a sponge wrung out of carbolic solution. There is no objection to the use of sutures, if care is taken; but if the wound is tightly sewed up, and suppuration allowed to take place beneath, serious consequences must ensue. Even if half the scalp is stripped off and hangs down the back of the neck, or over the face, it may be treated in this way, and often will adhere at once. If it does not, the under surface throws out granulations and union takes place by the third intention. In all cases of severe injury the patient should be confined to bed, and kept perfectly quiet, on low diet; and care must be taken that the bowels do not become constipated. It must never be forgotten that, in addition to the scalp wound, there may be very great injury to the brain.

So long as there is no pain nor fever, the wound should be left alone. If, however, one spot is tender, or if the temperature rises, or if there is any shivering, the wound must be exposed at once and carefully examined; it nearly always means that some of the secretion is pent up. As a rule, it is sufficient to introduce a probe or to loosen a suture— a drop or two of fluid escapes, and the symptoms are relieved at once (Moullin).

SCAMMONY.—A purgative gum-resin, the dried juice of the root of *Convolvulus scammonia*, a Southwestern Asiatic plant. It is generally given in combination with other drugs. Its properties are due to an active principle, jalapin. It is a drastic cathartic, and is contraindicated when there is a tendency to true inflammation of the bowels. It is anthelmintic against the tapeworm, and in overdoses produces a high degree of irritation. It is used as a drastic purgative for children with calomel or potassium sulphate. Treatment suitable for gastroenteritis may be necessary if poisonous doses have been administered. It is best given with colocynth or some similar drug. Dose, 1 to 10 grains. **S., Resina.** Dose, 1 to 5 grains.

SCAPULA, DISLOCATION.—The acromion may be dislocated from the scapula upward or downward. The conoid and the trapezoid ligaments are strong enough to make both injuries unusual, and the former very rare. A fall or blow is the most common cause; carrying heavy weights may be causative. This dislocation is easy to reduce, but very difficult to keep in place. Drawing the shoulder back and pressing the clavicle down will restore the joint, but the deformity recurs on removal of pressure. Velpeau's dextrin band and Holland plaster are the most successful methods of treating this dislocation. Sloughing of the skin is to be carefully looked for. A pad over the acromial end of the clavicle may be strapped down by means of a broad webbing band carried over it and under the point of the elbow. When the deformity is the first consideration, the patient should be placed perfectly flat on the back for a week or 10 days, the scapula fixed, the weight of the limb taken off, and the trapezius relaxed. See SHOULDER (Dislocation).

SCAPULA, FRACTURES.—The scapula is so much covered with muscle, and its connections with the trunk allow so much yielding on the application of external force, that fractures of this bone are extremely uncommon.

Varieties.—The injury may occur to its body, its

inferior angle, its **neck**, to the **acromion process**, or to the **coracoid process**.

Symptoms.—In fracture of the **body** of the bone the shoulder will be depressed and forced forward, and there will be marked irregularity between the ends of the fragments. Fracture of the **inferior angle** is marked by preternatural mobility, by displacement of the smaller fragment, and by acute pain at the seat of injury. In **fracture of the neck** the acromion is unusually prominent, the head of the humerus is felt in the axilla, the shoulder is flattened, the limb is lengthened, the coracoid process is found below the clavicle, severe pain and numbness are experienced in the axilla, and distinct crepitation is perceived on rotating the arm upon the scapula. In fractures of the **acromion** and of the **coracoid** the symptoms are somewhat similar to those presented by the fracture of the neck.

Treatment.—When the **body** is broken, a broad roller must be passed around the trunk, over a large flat pad placed over the scapula, and a few turns made around the arm so as to fix it to the side and prevent motion. Rest and quietude are required. Or a broad strip of adhesive plaster should be applied across the scapula, extending from the spine to the sternum, care being taken to press it well down along the anterior and posterior borders of the bone before the portions in front and behind the chest have been attached. Then place the arm in a Fox apparatus, and allow it to hang vertically along the side of the body, at the same time lifting the elbow by securing the straps to the ring on the opposite shoulder.

In **fracture of the neck** the shoulder must be supported by the sling and bandage that are used for fracture of the clavicle; but the pad should not be so thick, nor so large, and in addition a short sling should be used, going from the axillary pad on the injured side to the opposite shoulder. Opium, rest, leeches, and purgatives may be necessary for the contusion with which this fracture is accompanied. At the end of 4 weeks passive motion must be made to establish the functions of the joint.

In fracture of the **acromion** the bandages are to be applied so as to raise the elbow thoroughly, so that the head of the humerus may be lifted up against the acromion and keep its place. A pad must *not* be placed in the axilla, otherwise the broken part will be pushed outward too much.

When the **coracoid process** is fractured, the humerus must be brought forward and inward, so as to relax the coracobrachialis, and must be confined to the trunk, with the forearm bent on the chest.

SCARIFICATION.—The operation of making superficial incisions or punctures to allow the escape of serum or blood or gases. According to circumstances they may be deep or penetrate through the skin alone. In conjunctival chemosis, in early acute tonsillitis, in edema or engorgement of the glottis, and in congestions and certain acute inflammations of the uterus, in inflamed ulcers, and those in danger of gangrene, and, indeed, in almost any condition of great tension, the procedure will give relief.

SCARLET FEVER (Scarlatina).—An acute infectious disease, characterized by sudden onset, with vomiting, high fever, sore throat, and an erythematous rash. Serious complications and sequels are not uncommon. It is contagious from the beginning of the attack until desquamation has ceased, and under certain conditions after this time. One attack is rarely followed by subsequent ones.

Etiology.—While believed to be due to a micro-organism, none has as yet been demonstrated as the specific one. Streptococci have been found in the blood by many observers, and less frequently the staphylococcus aureus and the influenza bacillus, but these are probably present as a result of mixed infection. Scarlet fever occurs epidemically, and occasionally sporadically, the epidemics being most common in the fall and winter. As it is most contagious late in the disease (during desquamation), epidemics spread slowly.

The skin seems to be the chief source of infection, but it may be conveyed by the discharges from the mucous membrane of the nose, mouth, or throat, and by the urine, feces, or perspiration, and later, even after desquamation has ceased, by purulent discharges from rhinitis, otitis, suppurating glands, etc. The carpet and furniture of the sick room, and toys, books, and clothing, which may have been in contact with the patient, are often a medium of contagion, as may also be the attendants or nurses. Air may convey the infection for a short distance, and the usual route of infection is the respiratory tract. It may, however, enter by way of the digestive tract. Domestic animals may transmit the disease, and it has, in a number of cases, been spread by food—particularly milk. Children are much more susceptible than adults, but in either the susceptibility to scarlatinal infection is much less than to that of measles.

Pathology.—The parts primarily affected are the throat and skin. Lesions of other organs are rare, but, when present, are due to the fever and septic condition. The principal pathologic lesions due to complications are of the ear and cervical glands; the chief ones from sequels are those of the kidneys and heart.

The scarlatinal throat consists of an erythematous condition of the mucous membrane with the usual changes of a catarrhal inflammation. The skin is hyperemic, inflamed, and swollen, causing death of the epidermis, which is cast off during desquamation.

Symptoms.—The period of incubation is short —1 to 5 days—during which time there are no symptoms to indicate the onset of a disease.

The invasion is sudden: the first symptom in the majority of cases being vomiting. The child complains of chilliness, headache, and sore throat. The temperature will be high from the first (103° to 104° F.) and the pulse rapid and wiry. Prostration is usually well marked, and there may be slight delirium, and, in young children, convulsions. The skin is hot and dry, the face flushed, and the eyes bright.

On inspecting the throat, the tonsils, pharynx, and fauces will be found red and congested, and there will be seen on the hard and the soft palate minute macules of a darker red color than the intervening mucous membrane. An exudate resembling follicular tonsillitis, or even the membrane of diphtheria, may appear upon the tonsils.

At the end of from 12 to 36 hours after the onset the efflorescence appears, and in most cases is first seen upon the front of the neck and the upper part of the chest, but rapidly extends all over the body and face, being fully developed in the course of from 12 to 24 hours. The rash is of a bright scarlet color, and when viewed at a short distance, the whole surface of the body appears to be uniformly covered; but examined closely, it consists of great numbers of red points corresponding with the hair follicles; these points are surrounded by zones of erythematous redness, which, joining one another, give the general diffuse red appearance to the skin.

In some cases the rash consists of the points only, without the erythema; in others it may appear in patches with normal skin between. Rather rarely the rash is hemorrhagic, small extravasations of blood taking place into the skin; this may occur in mild, but is much more common in malignant, cases. With the eruption at its height there is intense itching or burning of the skin, and often considerable swelling, which is most noticeable upon the hands and face. The eruption remains at its maximum intensity for about 3 days and then fades in the order in which it appeared.

The temperature, which has remained high from the first, gradually declines after about the fourth day, or as the rash begins to fade, reaching the normal in 5 or 6 days. The tongue, which for the first few days was covered with a thick white fur, as the disease progresses becomes reddened with enlarged and prominent papillæ, the appearance giving rise to the name "strawberry tongue." The lymphatic glands at the angle of the jaw are usually enlarged and tender.

The constitutional symptoms during the eruptive period are marked by loss of appetite, constant thirst, somnolence with delirium or restlessness, with more or less nervous manifestations. The bowels may be either constipated or loose; the urine scanty, high-colored, and often containing albumin. Not infrequently the urine and stools are passed involuntarily. The respiratory tract is not often affected, though there may be a mucous discharge from the nose and in some cases a dry cough, due to the irritation in the throat. With the fading of the rash and the decline in the temperature the tongue clears, the throat becomes less congested, and the appetite improves; and, by the end of the first week, convalescence should be established; feverishness after this time would suggest some complication, as suppurating glands, purulent otitis, etc.

Desquamation begins soon after the rash fades —about the seventh day—and continues for a period of 2 to 5 weeks. It is usually first seen upon the chest and neck, and is composed of very fine scales. Desquamation upon the face is usually slight, or it may not occur at all. That which follows on other parts of the body, especially where the skin is thick and hard—as upon the inside of the fingers and hands and the soles of the feet—is composed of large scales, and a cast of the part may be thrown off like the finger of a glove. The hair, nails, and teeth are usually also affected. The hair breaks off after scarlet fever; the nails show indentations, and sometimes are shed; and the forming teeth are more or less affected.

While the foregoing description is that of a typical form of scarlet fever, in practice many cases are seen which vary from the mild form— when the child may make no complaint of being ill, the rash, and that often not well marked, being the first symptom—to the malignant form, when the onset is severe, with marked nervous symptoms, high fever, very rapid pulse, diarrhea, and marked glandular swelling and cellulitis, the child dying during the first 24 hours, or lingering for 2 or 3 weeks, when death results from exhaustion or from septicemia.

Complications and Sequels.—The inflammation of the throat may be so severe as to constitute a serious complication. The soft palate may slough, and all the soft parts be destroyed. The inflammation may spread to the larynx, making, in some cases, tracheötomy necessary. Purulent **otitis media** is a common complication, and is caused by extension of infection through the eustachian tubes. It may occur either during or following the active stage, and it is the most frequent cause of continued fever after the rash has disappeared.

Following severe cases, **adenitis** may occur, often accompanied by suppuration and ulceration of the cervical lymph-glands; cellulitis of the neck may occur. Septic cases may be complicated by **bronchopneumonia** or **pleurisy,** and also by **endocarditis** and **myocarditis.**

Arthritis, septic, rheumatic, or tubercular, sometimes occurs with or following scarlet fever.

Rarely nervous affections may arise as complications, such as meningitis, chorea, hemiplegia, convulsions, progressive paralysis.

Nephritis is the most frequent complication, and may occur in an otherwise mild and favorable case. Besides the transient albuminuria, which is nearly always present during the febrile stage, two forms—septic and post-scarlatinal nephritis— occur. The septic form occurs in severe cases complicated by sloughing tonsils and soft palate and much glandular involvement. The urine contains large quantities of albumin, and, postmortem, a pyemic kidney may be found, but dropsy or other renal symptoms are seldom discovered.

Postscarlatinal nephritis occurs during the third or fourth week. The child, who had recovered from the fever, will again become feverish, restless, and thirsty, have a quick hard pulse, and pass small quantities of dark-colored urine containing albumin and casts. The face becomes pale and puffy, and there may be edema of the feet and scrotum or general dropsy.

In mild cases by the end of a week improvement will take place, and the child go on to recovery. In others, however, uremic symptoms may supervene, the pulse becomes slow, the temperature subnormal, and vomiting and marked nervous symptoms appear. Dilatation of the heart is a frequent result of the kidney affection. Recovery takes place in the great majority of the cases of nephritis following scarlet fever, but it may be prolonged for weeks or, rarely, for months.

Diagnosis.—The diagnosis of the usual type is not difficult—the symptoms mentioned above all occurring together in no other disease. In some cases, however, the rash may appear not unlike measles; in others, the throat symptoms being prominent may lead to a diagnosis of diphtheria; but in a great majority of cases a mistake is not probable. However, there may be no distinctive eruption, but close watching will sometimes detect signs of desquamation in the shape of branny scales beneath the underclothing or in the stockings. In other doubtful cases the development of nephritis settles the diagnosis.

The following table gives the principal points of difference between these diseases:

	Scarlet Fever.	Measles.	Diphtheria.
Onset	Sudden, with vomiting	Gradual, with coryza and photophobia.	Gradual.
Temperature	High (103° to 105° F.)	High, but drops with appearance of rash.	Low.
Cervical glands	Involved, usually	Not involved	Involved.
Appearance of throat	Mucous membrane of hard and soft palates much congested and red eruption first seen there.	Throat not involved	Dusky red color early.
False membrane	When present, resembles follicular tonsillitis.	None	Characteristic.
Bacteriologic test	Probably find streptococci	Negative	Klebs-Loeffler bacillus.
Pulse	Very rapid and wiry	Full and bounding	Increased, but weak.
Urine	Frequently slight albumin	No albumin	Albumin.
Rash	Scarlet color, first seen on neck and chest, appears within 36 hours after onset.	Darker color, first on face; appears fourth day.	None typical.
Desquamation	Marked, beginning furfuraceous, becomes lamellar, continues 3 or 4 weeks.	Slight, furfuraceous	None.

Certain drugs, as belladonna, quinin, and antipyrin, and digestive disturbances, especially in infants, are often accompanied by a rash, which closely resembles that of scarlet fever. It is, however, of short duration. In diphtheria, influenza, and varicella an erythematous rash is occasionally seen that may cause them to be mistaken for scarlet fever; but when the history of the case, the order of the appearance of the rash, etc., are considered, a correct diagnosis may in most cases be reached.

Prognosis.—The prognosis should be guarded in all cases of young children. The mortality varies greatly in different epidemics, and may be as low as 5 or 6 percent, or as high as 20 or 30 percent, and in very young children as high as 50 percent. It depends generally upon, first, the severity of the epidemic; second, the age and resisting power of the individual; and, third, upon the nature of the complications. In no disease is the prognosis more uncertain than in scarlatina.

Treatment.—The patient should be isolated for a period of 5 or 6 weeks, or until desquamation is completed. Should there exist such complications as otitis, rhinitis, or suppurating glands, quarantine should be continued until these conditions are cured. Other children in the house who have not been exposed to the disease should be sent away.

After recovery, the patient should, before mingling with others, be thoroughly scrubbed with soap and warm water and washed with an antiseptic solution—*e. g.*, bichlorid of mercury, 1:5000—and dressed in clean clothing. The sick room should be on the upper floor; it should be well ventilated, and kept at a uniform temperature of about 68° F. The ideal method of heating is by an open-grate fire.

The room should be stripped of all hangings, carpets, and unnecessary furniture, and a sheet wet with a solution of carbolic acid, 1:100, or bichlorid of mercury, 1:1000, kept hung over the doorway, and the floor frequently sprinkled with the same solution. All excreta from the patient should be disinfected by carbolic acid, 1:20. The nurse should wear a cap covering the hair, and a washable dress, and should not mingle with other members of the family until her hands and face are thoroughly cleansed and her clothing changed.

The same care should be given to the disinfection of all bed-clothing, cloths, eating utensils, etc., as in diphtheria. The physician before entering the sick room should remove his coat and put on a long gown or rubber coat, and after the visit his hands, face, and hair should be washed and disinfected.

If it can be avoided, the physician attending a scarlet fever patient should not attend an obstetric case or other patients with open wounds. When this is impossible, however, he should use the greatest care in disinfecting himself.

Children should be kept in bed for at least a week after the fever has subsided, and on a liquid diet for 2 weeks longer, as this is important in preventing nephritis. Plenty of water should be given to drink, and the addition of 10 or 15 drops of dilute muriatic acid to the glass of water will often prove grateful to the patient.

Systematic bathing and inunctions should from the first be insisted upon, as this reduces the fever and restlessness, keeps the skin active, shortens the course, and prevents complications. The patient should be thoroughly sponged all over daily, or when the temperature is high every few hours, with carbolized water (1:100) or bichlorid of mercury (1:8000), or, if preferred, salt water, or alcohol and water. The temperature of the water should be from 70° to 100° F., according to the amount of fever present, using the cooler baths when the temperature is high. Following the sponging there should be applied all over the body cacao-butter, lanolin, or cosmolin, to which may be added 10 grains to the ounce of menthol, or the following:

℞. Carbolic acid, gr. v
Menthol, } each, gr. x
Thymol, }
Lanolin, ℥ j.

The inunctions are agreeable to the patient, relieve the itching and burning, prevent the scales from becoming disseminated through the air, and at the same time protect the surface and render joint involvement less likely to occur. The bathing and inunctions should be continued as long as desquamation exists.

The hygiene and proper treatment of the nose and mouth is also very important, tending to prevent ear complications. The throat should be sprayed or gargled with an alkaline or antiseptic solution 3 or 4 times a day. For this purpose may be used a solution of bicarbonate of sodium (20 grains to the ounce), a solution of listerine, one of the various modifications of Dobell's solution, or—

℞. Hydrogen dioxid, } each, ʒ j
Glycerin, }
Water, ℥ iij.

To a young child who cannot gargle the following may be given:

℞. Boric acid, gr. xx
Salicylic acid, gr. xxx
Peppermint water, ʒ j
Water, ℥ iij.
One teaspoonful every 2 hours until the throat symptoms are relieved.

Or—

℞. Tincture of iron chlorid, ʒ ij
Glycerin, ʒ j
Water, ℥ iij.
One teaspoonful every 3 or 4 hours.

The nose should be sprayed 2 or 3 times a day with a mild alkaline solution, and an oily substance applied to the anterior and posterior nares by means of cotton on a match-stick or probe. For this purpose may be used 5 or 10 grains of menthol in an ounce of liquid albolin. Cold compresses or ice applied to the throat externally is very soothing. If the throat symptoms are severe, adrenalin chlorid sprays may be used as well as inhalations of steam impregnated with oil of eucalyptus or compound tincture of benzoin.

When there is constipation, small doses of calomel should be given to act upon the bowels, and when, as sometimes occurs, diarrhea is troublesome, one of the bismuth mixtures mentioned under diarrhea of infants and children should be given.

The vomiting that was present at the onset seldom persists after the first 24 hours; should it do so, however, small bits of ice should be given to swallow every 5 or 10 minutes, and camphorated tincture of opium, in 1- to 5-drop doses every 2 or 3 hours, or cocain, 1/20 grain. Food should be withheld while there is any vomiting.

For the nervous symptoms may be given phenacetin or acetanilid (1/2 grain for each year of a child's age), repeated in 3 or 4 hours if necessary. To this should be added 1/2 to 1 grain of quinin to each dose, if the child will take a capsule.

A very weak or irregular pulse or cyanosis calls for stimulants: aromatic spirit of ammonia, 10 drops in water, or brandy or whisky, 10 drops to a teaspoonful according to the child's age; as soon as the urgent symptoms are relieved, discontinue the use of the alcohol, however, owing to its action upon the kidneys.

A useful heart stimulant for these cases is the following:

℞. Camphor water, } each, ℥ j.
Tincture of musk, }
From 1/2 to 1 teaspoonful in water every 2 hours.

Strychnin (in doses of 1/100 to 1/30 grain according to the age of the patient) or nitroglycerin (in doses of 1/500 to 1/100 grain) are also very useful.

The prevention of complications is of paramount importance. The drum membrane should be watched for signs of bulging and if found, paracentesis should not be delayed. The urine should be examined daily for the onset of nephritis; in order to prevent this complication the patient should be shielded from drafts and kept on liquid diet in bed at least a week after the cessation of febrile symptoms. Urotropin is recommended as a prophylactic remedy.

By the careful hygienic treatment of the nose and throat, and by the baths and inunctions, complications will be much less frequent, but when they do arise, the treatment is the same as for similar conditions when occurring independently of scarlet fever.

During convalescence iron, cod-liver oil, and general tonic treatment are indicated.

Serum Therapy.—Injections of antistreptococcic serum instituted early in the disease in doses of 20 c.c. have proved markedly valuable for the relief of the complications that occur so frequently as a result of streptococcic infection.

SCHISTOSOMIASIS **(Bilharziosis).**—A chronic parasitic, tropical disease, characterized by hematuria, cystitis, proctitis, due to the eggs of the blood fluke, distomum or schistosomum hematobium. Lesions due to the parasites are found in the kidneys, urethra, bladder, liver, rectum. The ova of the worm are easily detected by microscopic examination of the urine and feces. The parasite probably gains entrance to man through drinking or bathing in or working with infected water, or with some mollusc, fish or vegetable. Treatment is merely prophylactic and palliative.

Schistosomum Japonicum resembles the S. hematobium, but is smaller and the eggs have no spines. This infection is characterized by enlargement of liver, spleen and mesenteric lymph glands, anemia, diarrhea, enteritis. The eggs, which resemble those of ankylostomum duodenale, are found not in the urine but in the feces.

SCHLEICH'S INFILTRATION ANESTHESIA.—See INFILTRATION ANESTHESIA.

SCHLEICH'S MIXTURE (for General Anesthesia).—See ANESTHETICS.

SCHOTT TREATMENT.—The Schott method may be stated briefly as consisting of the systematic use of saline baths of definite strength and temperature, and the coincident or alternative employment of a certain series of resisted movements. The treatment originated in Nauheim, Germany, where the natural springs are strongly saline and heavily charged with carbonic acid gas, their varying temperature and strength making them admirably adapted to therapeutic use. The most important chemic constituents of these baths are sodium chlorid (1 to 3 percent), calcium chlorid (0.1 to 0.3 percent), with a considerable quantity of iron, and a large amount of free carbonic acid gas. Their temperature varies from 81.7° to 95.5° F. In practice the higher temperature and weaker waters are first used, the waters being freed from the carbonic acid gas; a lower temperature, effervescent bath, and greater strength in saline constituents being gradually attained as the treatment progresses. Baths are given daily, rarely more than 3 being taken consecutively, that of the third or fourth day being omitted. While the natural baths are better adapted to treatment, perfectly satisfactory results may be obtained from artificial baths made after the following:

Formulas.—To 40 gallons of water (usual amount required) add sea-salt, 3 to 10 pints (approximate strength 1 to 3 percent); calcium chlorid, pure, 11 to 15 ounces. It is important to note that this latter ingredient is not the commercial chlorid of lime, which, by giving off chlorin, would become a source of discomfort and danger. To introduce or generate carbonic acid gas we may use a soda siphon with conducting tube or the following formulas of Bezley Thorne:

Mild.—$NaHCO_3$, 1/2 pound; HCl (25 percent), 3/4 pound.

Medium.—$NaHCO_3$, 1 pound; HCl (25 percent), 1 1/2 pounds.

Strong.—$NaHCO_3$, 2 pounds; HCl (25 percent), 3 pounds.

The salts are first dissolved; the hydrochloric acid is then added and thoroughly distributed. It has been found that the best agent for adding the acid is a douche bottle and tube, the acid being thus evenly distributed throughout the mixture.

Immersion.—The patient remains immersed from 5 to 20 minutes, the first bath being brief and the period gradually lengthened. If the patient is very ill, he should be carried to and from the bath and spared any exertion. While in the bath he should remain absolutely quiet, breathe regularly, and refrain even from speaking. Upon leaving the bath he may be rolled in warm blankets, to rest for at least one hour.

Temperature.—The temperature is at first about 93° F., and may be considerably reduced after the 6 or 8 baths have been taken and the use of carbonated baths begun, provided such reduction is considered necessary. Usually, the patient's sensation is a safe guide to the regulation of temperature. The bath should feel pleasant and quite definitely warm throughout the period of immersion, and the patient should be cautioned and told to report at once any tendency to chill.

The movements are very simple Swedish movements, and, as recommended by Schott, comprise 19 exercises, so planned as to bring into action every muscle group in the body. The movements are intended to produce without fatigue the beneficial result of exercises, and are of decided value in the treatment of almost all cases to which the baths are applicable.

Effect of Baths.—(1) There is a fleeting sense of oppression and dyspnea; (2) a feeling of exhilaration and well-being; (3) slowing of the pulse, and, coincidently, a fuller and stronger beat; (4) brightening of skin, nails, and mucous membrane, indicating relief of cyanosis, freer capillary circulation; (5) secondary reduction of pulse tension with maintenance of lower rate; (6) marked reduction in cardiac area, most marked primarily in the right heart, but involving both lateral and vertical dimensions. See HEART-DISEASE (Organic).

SCIATICA.—Pain in the course of the sciatic nerve. This may be confined to the proximal half of the thigh, or may follow the entire course of the nerve and its branches. The pain is constant and gnawing, subject to exacerbations, and occurs most commonly in adults of middle age. Double sciatica is rare.

Causes.—As a rule, neuritis of the sciatic nerve or of its cords of origin exists. Rheumatism or gout, exposure to cold, heavy muscular exertion, or a thorough wetting, cause primary sciaticas, while compression by ovarian or uterine tumors, by lymphadenoma, the fetal head, or occasional lesions of the hip-joint induce secondary sciaticas.

The duration and course are variable, but chronic sciatica usually lasts for months, or, with remissions, for years.

Diagnosis requires a distinction between primary sciatica and the secondary affection due to diseases of the pelvis or spinal cord. Pelvic tumor and lumbago should be excluded. Hip-joint affections cause no tenderness along the course of the nerve, and sacroiliac disease has usually radiating pain. When the nerve-trunks of the cauda equina are pressed upon, there are bilateral pain and disturbances of sensation. The severe lightning pains of tabes are easily distinguished.

Treatment requires that careful and systematic pelvic examination be made, and that constitutional conditions should receive appropriate attention. Salicylates are useful in rheumatic cases, when the onset has been acute and accompanied by fever. Potassium iodid will remove a suspicion of syphilis, and salines improve gouty cases. Rest in bed with fixation of the limb on a long splint will relieve obstinate and protracted cases. Warm or mud-baths are sometimes satisfactory.

Quinin, antifebrin, and antipyrin are of doubtful use. Local applications of a hot iron, thermocautery, or blisters may temporarily relieve pain. Cocain, in doses of 1/8 to 1/4 of a grain, may be used by deep injection into the nerve. An acupuncture needle may be thrust into the painful spot for a distance of 2 inches, and left there for from 15 to 20 minutes. Injections of distilled water or normal saline solution into the nerve may relieve the pain. Electricity is uncertain, and morphin should be withheld as long as possible or until the pain is unbearable.

Nerve stretching, in very obstinate cases, is sometimes successful, but often the condition recurs. The incision is begun at the gluteal fold and carried down the back of the thigh for 4 inches. The nerve is exposed, properly cleaned from the surrounding tissues, and then raised with a blunt hook on the forefinger. It should be stretched both centrifugally and centripetally, maintaining the traction for about 5 minutes. The surgeon must decide the amount of force to use in each case by the size of the nerve. Experiments show that the breaking strain of a healthy sciatic nerve is never under 80 pounds.

SCILLA.—See SQUILL.

SCLEREMA NEONATORUM.—Sclerema is a rare disease, which occurs in the early days of life, and affects those, chiefly, who are weak and feeble, born in cold weather and in poor hygienic surroundings. It is characterized by hardening of the skin and subcutaneous tissues.

The causes of sclerema are generally not local, the most important etiologic factors being great feebleness, with lowering of the body temperature, and, in consequence, hardening of the subcutaneous fat.

Symptoms.—Soon after birth spots of circumscribed hardness appear on the skin. These are often first seen on the feet or calves of the legs, but soon spread over the greater part of the body. The skin has a waxy and glistening appearance, and is hard and cold; the limbs becoming thick, stiff, and misshapen. The temperature is subnormal—reaching in some cases 83° to 86° F. in the rectum. The infant soon grows weak, somnolent, and refuses to take its food. The breathing becomes rapid and superficial, and no pulse can be felt.

The duration of the disease is 3 or 4 days, and death occurs slowly and quietly. If recovery takes place, there is gradual improvement in the circulation and nutrition, and later a disappearance of the areas of induration.

The treatment should consist of artificial heat—the child should be placed in an incubator. Inunctions of hot oil with massage should be given, and the nutrition kept up by stimulants and careful feeding.

SCLERITIS (Episcleritis).—Inflammation of the scleral tissue characterized by a purplish injection of the ciliary, deep pericorneal, and conjunctival vessels.

Symptoms and Diagnosis.—If the conjunctival vessels are kept empty by gentle pressure, the bluish scleral vessels are seen more clearly. There is considerable pain on pressure and some local swelling. Carefully examined, a flat nodule made up of minute vesicles is seen lying about 3 mm. from the edge of the cornea (episcleritis). The disease is intimately connected with rheumatic disorders, syphilis and tuberculosis. The diagnosis is easily made, and depends upon the characteristic local condition and rheumatic, gouty, syphilitic or tuberculous history. Most cases are rheumatic in origin. The course of the disease is protracted, sometimes one nodule after another being formed until a large portion of the sclera is occupied by blotches. Relapses are frequent, and are closely connected with general rheumatic paroxysms. The pain is more or less severe, and for the time the eye is practically useless for near work.

Treatment is general. Salicylates and the ordinary rheumatic treatment should be instituted; or if syphilis or tuberculosis is defined, the respective treatment should be inaugurated. Ordinarily, local treatment should be avoided, but in chronic cases massage with yellow ointment may be tried. For the relief of the pain, moist heat and pressure are advised. If the choroid is involved, atropin is indicated. See TUBERCULOSIS (Ocular).

SCLERODERMA (Hide-bound Disease).—A disease characterized by circumscribed or diffuse induration, rigidity and stiffening of the integument, terminating in atrophy.

Symptoms.—The disease is exceedingly rare. The skin manifestations may be preceded or accompanied by disturbance of cutaneous sensibility, such as pain, prickling, tingling, formication, etc., and by muscular cramps. The disease begins as a pronounced stiffening or hardening of the skin, which progresses gradually, or more rarely rapidly, until marked induration results. In some cases an edematous stage may precede the induration. When the disease is typically developed, the skin is thickened, tense, hard, and immovable, acquiring in an advanced stage the feel of frozen skin, leather, or even wood. It is bound down to the structures beneath, and is incapable of being lifted. There is usually pigmentation of a yellowish or brownish hue.

After a variable duration the stage of induration passes on to the stage of atrophy. The skin then becomes thinned, shiny, and tensely stretched over the bony prominences. The phalangeal joints are apt to become ankylosed in a semiflexed position (sclerodactylia).

The course of the disease is chronic, although in rare cases it may be acute. The general health is, as a rule, not compromised. The parts most affected are the neck, face, forearms, chest, and lower extremities.

Etiology.—Scleroderma occurs chiefly in early adult and middle age, and is far more common in women than in men. Exposure to cold and wet, rheumatism, and nerve shocks have been causal in many cases. The disease is brought about through the implication of the nervous system.

Pathology.—The chief changes noted in scleroderma are an increase and condensation of the connective tissue in the corium and subcutaneous tissue, an increase in the elastic tissue, and a diminution in the caliber of the blood-vessels. Later there is atrophy of the subcutaneous tissues.

Diagnosis.—The peculiar immobile, indurated, tightly adherent condition of the skin is highly characteristic of the disease. Morphea is looked upon by most writers as a circumscribed form of scleroderma.

Prognosis should be guarded; in some cases the disease undergoes spontaneous involution; in many it persists throughout life.

Treatment.—Internal treatment is to be based upon general principles, arsenic, quinin, and cod-liver oil being frequently of value. Locally, baths, massage with oily substances, and electricity may be employed with benefit.

SCLEROSIS, CEREBROSPINAL.—See Disseminated Sclerosis.

SCLEROSIS, SPINAL.—See Amyotrophic Lateral Sclerosis, Lateral Sclerosis, Paraplegia.

SCLEROTOMY.—See Glaucoma.

SCOLIOSIS.—See Spine (Curvature).

SCOPARIUS (Broom).—The dried tops of the common broom plant, *Cytisus scoparius*. Its properties are due to a neutral principle, scoparin, and an alkaloid, spartein. It is diuretic and laxative; in large doses it is cathartic and emetic. It is a favorite remedy in cardiac dropsy and kidney complaints. Dose, 5 to 30 grains. There are no official preparations. See Spartein.

SCOPOLA.—See Hyoscyamus.

SCOPOLAMIN.—See Hyoscyamus.

SCOPOLAMIN-MORPHIN ANESTHESIA.—See Anesthetics (Anesthetic Mixtures).

SCORBUTUS.—See Scurvy.

SCORPION BITES.—See Bites and Stings.

SCOTOMA.—See Field of Vision.

SCREAMING, NIGHT.—See Nightmare.

SCROFULA (Tuberculous Adenitis; Lymphadenitis; King's Evil).—A morbid condition, usually constitutional, and frequently hereditary, characterized by glandular tumors having a tendency to suppuration, and leaving indolent ulcers very stubborn to treatment. It is now generally accepted as a manifestation of tuberculosis. The term is gradually falling into disuse.

Etiology.—It is most generally seen in children and young adults, especially those who suffer from nasopharyngeal catarrh. It is very common in the negro race. The bacillus of tuberculosis is the specific cause of the disease.

Pathology.—The cervical glands are those most frequently enlarged. The tubercles form first in the lymphoid follicles, finally breaking through the capsule. Generally, caseation ensues with subsequent liquefaction, and suppuration begins, with the establishment of a sinus.

Symptoms.—There is usually a history of tuberculosis in the father or mother, or a neglected nasopharyngeal catarrh. One gland may be first affected, becoming enlarged and painful. Usually the gland is hard, the color of the skin overlying being unaltered. Soon the lymph-channels convey the virus to neighboring glands, which become diseased, break down, and suppurate. Often the process of liquefaction does not come on until late, and the gland may seem to remain of one size indefinitely. The temperature is variable—from normal to 102° F.; the child seems peevish, and endeavors to protect the affected side by inclining the head in the opposite direction. The body is often greatly emaciated, and signs of grave anemia are very prominent.

Diagnosis.—

SCROFULA.	HODGKIN'S DISEASE.	LYMPHATIC LEUKEMIA.	LYMPHOMA.
1. Most common in children and young adults; cervical glands most frequently enlarged.	1. Not common in children; principally cervical or submaxillary glands.	1. Middle life.	1. Early life; all glands involved.
2. Glands often painful.	2. Glands not tender.	2. Glands not tender.	2. Glands freely movable, not especially tender.
3. Glands suppurate.	3. Glands rarely suppurate.	3. Glands rarely suppurate.	3. Glands rarely suppurate.
4. Blood may show evidence of anemia.	4. Blood shows signs of moderate anemia.	4. Marked persistent increase of white blood-corpuscles. See Leukemia.	4. Blood shows signs of simple anemia.

Prognosis.—If the disease is located in the cervical region or near the external surface in any portion of the body, prognosis is favorable.

Treatment.—The best of hygienic surroundings, with good and nutritious food, are demanded. Tonics are valuable, such as the iron iodid (5 to 15 minims) 3 times a day. The elixir of the phosphates of iron, quinin, and strychnin (5 to 30 minims), according to age.

An emulsion of cod-liver oil is also very valuable:

℞.	Syrup of the iodid of iron,	ʒ vj
	Cod-liver oil,	℥ iv
	Whisky,	℥ j
	Bitter-almond water,	ʒ ij
	Cinnamon water,	℥ ij
	Yolks of two eggs,	
	Water, enough to make	℥ x.

Beat up the eggs in a mortar for 15 minutes, and gradually add the oil; then the other ingredients, the whisky being added last.

Two teaspoonfuls 3 times a day.

If suppuration ensues, the glands must be excised.

Tabes Mesenterica.—This is an involvement of the retroperitoneal lymph-glands, and is common in young children. The limbs and trunk are greatly wasted, and the belly becomes very prominent from tympanites. There is often diarrhea, with offensive stools, yet the bowels are not generally the seat of tuberculosis. There may be infection of the peritoneum, also giving rise to an uneven, nodular, tender, and painful enlargement, easily detected on palpation.

SCROTUM, DISEASES.—**Edema** may occur in nephritic subjects, causing great swelling; and a similar affection, generally inflammatory, is occasionally seen in infants.

Inflammation is quite common, but unless associated with extravasation of urine, or unless the nutrition is much enfeebled, as in specific fevers, sloughing and gangrene rarely occur. Inflammation of the scrotum may arise from injury, eczema, irritation of urine, retained perspiration, or may spread from neighboring tissues. The swelling is much greater proportionately than the pain, heat, and redness. See TESTICLE (Inflammation).

Elephantiasis.—Enormous hypertrophy of the tissues of the scrotum may be caused by lymphatic obstruction or by repeated attacks of inflammation, as in cases of urinary fistula. The skin and subcutaneous tissues only are affected, the cellular elements and the fibrous tissue being immensely increased, while all the interstices are filled with lymph, or, in rarer cases, with a mixture of lymph and chyle. Hydrocele is usually associated with elephantiasis, and the skin of the penis may become involved, but the testes are never affected.

Epithelioma is of interest from the fact that its origin can nearly always be traced to local irritation; it formerly was often called chimney-sweeps' cancer, from the frequency with which it occurred in chimney-sweepers as the result of irritation of soot. It begins as a wart or nodule, which slowly spreads at the margin as it decays and ulcerates in the center. Induration is its chief feature. The edges are raised, hard, and ill defined; the base is covered with decaying epidermis and florid granulations which discharge a thin, offensive fluid, and the tissues around are swollen and edematous. At first it can be pinched up from the structures beneath, and merely feels like an induration in the skin; soon it infects the lymphatic glands in the groin, spreads to the rest of the scrotum and the penis, and involves the testicles as well. Fortunately, its character is so well known among those liable to it (soot may cause it in other parts of the body, and there is reason to believe that tar may do the same), and its progress (for epithelioma) is so slow, that removal in time is usually possible. Even if the inguinal glands are enlarged and broken down, the whole of the disease may sometimes be successfully eradicated.

Examination of Scrotal Swellings.—Swellings of the scrotum are divided into those that occupy the canal as well as the scrotum, and those that are confined to the latter situation. The distinction is made by feeling the cord immediately below the pubes: whether it is the natural size, with all its components distinct, or whether it is thickened or concealed in any way.

Swellings that Occupy the Canal as well as the Scrotum.—Those that are *reducible* are:

Bubonocele and *scrotal hernia*, which may be recognized by the way in which they disappear whether they consist of intestine or omentum.

Varicocele, diagnosed by its characteristic feel, the way in which it disappears when the patient lies down and the scrotum is raised, and refills in spite of the pressure of the finger on the ring.

Congenital hydrocele, known by its translucency. As the neck of the canal is often long and narrow, reduction is not always easy.

Those that are *irreducible* are:

Hernia, which cannot be returned because it is *strangulated* (in which case there is no impulse on coughing), or because it is *irreducible*—*i. e.*, so altered in shape or so tied down by adhesions that it cannot pass back. In strangulation constitutional symptoms are also present.

Infantile Hydrocele.—The neck of the tunica vaginalis is obliterated only at the internal abdominal ring, and a collection of fluid extends from the bottom of the scrotum along the inguinal canal. The slow formation, commencing below and extending upward, the translucency, and the absence of true impulse (if it extends really into the canal, there may be a kind of shock transmitted) are distinctive.

Inflammatory Affections of the Cord.—In urethral epididymitis this is sometimes swollen to a considerable size; in tubercular disease the vas only is thickened, and all the structures of the cord can be isolated.

Growths on the Cord.—The most common is *encysted hydrocele*, a small, round, and tense fluid swelling, due to incomplete obliteration of the funicular portion of the tunica vaginalis. It is movable in the canal, but cannot really be reduced, and it is adherent to the cord, forming part of it and moving with it.

Lipoma, sarcoma, and other growths may occur, but they are very rare. Secondary infiltration is always present in malignant disease of the testis, if the gland is not speedily removed. *Hematocele* of the cord has been described. See HEMATOCELE.

Swellings Confined to the Scrotum.—*Of those connected with the scrotum itself* are:

Edema.—In Bright's disease the whole scrotum sometimes becomes enormously distended without the legs being much affected.

Elephantiasis.—In the tropical variety there can be no hesitation, but occasionally a greatly thickened and hardened condition, not so plainly recognized, occurs as a result of neglected stricture.

Lipoma, epithelioma, and other varieties of new growths may occur.

Those connected with the testis and its coverings may be solid or fluid. The former include inflammatory diseases and tumors of the testis. The chief difficulty occurs with hematocele and old hydrocele, the walls of which may be so thick that they are practically solid. The latter may be connected with the tunica vaginalis (hydrocele or hematocele), the testis or epididymis (encysted hydrocele), or the lower end of the cord (hydrocele of the cord); or they may be independent cysts—dermoid, for example, or hydatid. Some difficulty may arise from what is known as hydrosarcocele, a collection of fluid in the tunica vaginalis surrounding and concealing an enlargement of the testis, and the diagnosis may remain uncertain until the fluid is drawn off (Moullin). See TESTICLE (Diseases).

SCURVY. (Scorbutus).—A constitutional disease, characterized by a spongy condition of the gums and by a tendency to hemorrhages into the gums, muscles, joints, and internal organs. The blood shows the same characteristics as seen in the secondary anemias.

Etiology.—It is principally due to eating too much salt meats or corned meats, and not enough of fruits and vegetables. It is most often observed in sailors, soldiers, miners, and in remote habitations, where there is a limited amount of proper food.

Pathology.—The gums are soft and spongy, often being ulcerated to such a degree that the teeth drop out. There may be hemorrhages into the mucous surfaces, as into the gums. Often ecchymotic spots are seen on the external surfaces, and occasionally in the serous membranes.

Symptoms are usually of slow development and in early stages they are manifested by fatigue, by a craving for acid foods, and by constipation. There is an anemic appearance of the skin, or it may have a yellowish appearance. The gums are congested, and bleed on the slightest touch, and hemorrhagic spots are found dotted over the mucous membrane of the mouth, principally of the gums.

Prognosis is good.

Treatment.—Prophylactic treatment consists in a diet including onions, limes, lemons, oranges, canned vegetables, etc. Fractional doses of calomel (1/4 of a grain) should be given every hour until 6 doses have been taken, followed by a saline purge, if necessary. Subsequently, the diet should be principally composed of fruits and vegetables.

When cônvalescence is established, a tonic containing iron may be given:

℞.	Arsenous acid,	gr. j
	Strychnin,	gr. ss
	Mass of carbonate of iron,	ʒ iij.

Divide into 30 pills. One pill after meals.

Or—

℞.	Tincture of ferric chlorid,	ʒ iv
	Aromatic elixir,	ʒ iv
	Water, enough to make	℥ iij.

One teaspoonful after meals.

SCURVY, INFANTILE.—Infantile scorbutus is a constitutional disease associated with imperfect nutrition due to some prolonged error in diet. It is manifested by rapid and progressive cachexia, profound anemia, etc.

Etiology.—The cause of scorbutus is probably of chemic origin, due to the continued use of food that either lacks some elements required for the child's nutrition or which furnishes them in such a form that the child cannot assimilate them.

Scurvy occurs nearly always between the sixth and twenty-fourth months, and in nearly all cases in babies who are artifically fed. It occurs in the well-to-do as well as in the poor and neglected—more frequently in the former, as in the latter class the diet is, as a rule, more varied, and although not in every respect suited to proper nutrition, it contains the antiscorbutic elements. A large majority of the cases reported have occurred in babies exclusively fed on condensed milk, sterilized milk, or on the various proprietary foods combined with sterilized milk, or on these foods prepared without the addition of the proper proportions of milk and cream.

Pathology.—Hemorrhages occur frequently in the skin, mucous membranes, muscles, viscera, and subperiosteal tissues of the bones. Extensive ulceration of the gums, with exuberant granulations often overlapping the teeth, are common in advanced cases. The blood presents all the characteristics of anemia, such as a diminution of the red blood-corpuscles and a decrease in the percentage of hemoglobin.

Symptoms.—The onset is gradual; the child becomes anemic, and suffers with more or less severe attacks of gastrointestinal disturbances. The appetite is diminished or irregular; the stools may be normal, but are often irregular, pasty, and gray in color; sweating of the head, as in rickets, has been noticed, and the child is often feverish. These are simply symptoms of indigestion, which generally, but not always, precede for a variable length of time the symptoms of scurvy.

The first symptom which suggests the true nature of the disease is a sensitive condition of the bones, the infant crying when the affected parts are touched. It will also be noticed that the gums are congested and bleed readily. As the disease progresses, the limbs become swollen. Only the legs are usually affected, but the forearm may also become swollen and tender. The enlargement of the limbs may continue until they become double their natural size. The swelling is not usually accompanied by any local heat or discoloration, but the skin has a white, transparent appearance. When the child is not disturbed, it will often lie for hours in one position, the legs being kept extended or slightly flexed, but absolutely motionless; but when it is disturbed or handled, there is apparently intense pain, which is indicated by piercing screams.

Ecchymoses may occur upon the skin over the swelling or upon other parts of the body, especially about the eyes. Intraorbital hemorrhage may give rise to exophthalmos. The gums are not affected when the teeth have not appeared; but when any of the teeth have been erupted, the gums about them become swollen, spongy, and bleeding, and may ulcerate; the teeth may become loosened and fall out, and the mouth may be filled with a bloody and foul-smelling secretion.

Diagnosis.—In certain cases rickets may resemble scurvy, but in rickets there occur curvatures of the bones and enlargement of the epiphyses, while the swelling of the shaft of the bones, the gingivitis, and the purpura are absent. The immobility of the limbs has led to a diagnosis of paralysis; the swelling and the pain to diagnosis of rheumatism, hip-joint disease, fracture, osteosarcoma, etc.; but errors in diagnosis may be avoided by attention to the associated symptoms of swelling and tenderness of the extremities, to the fungous and bleeding condition of the gums, and to the cachexia and anemia. Whenever any doubt exists as to the nature of the affection, the results of treatment will speedily establish the diagnosis.

Prognosis.—The course is slow and progressive, and when left untreated, the child may finally die of exhaustion. On the other hand, cases which receive proper treatment early never develop the graver forms of the disease, and in them the prognosis is invariably favorable.

Treatment.—The treatment of infantile scorbutus consists of substituting for the improper diet one of fresh milk modified according to the child's age. See INFANT FEEDING, MILK (Modified). The juice of one orange, or even more, should be given in the 24 hours. Children usually take this readily; but should they refuse to do so, they should be forced to take it. Beef-juice, a teaspoonful added to the milk, or given alone, should be given 3 times a day, and 1 to 3 grains of the ammoniated citrate of iron in the orange-juice 3 times a day. The child should receive a warm salt bath daily, and should be in the fresh air and sunlight as much as possible.

SCUTELLARIA.—Skullcap. The dried plant *S. lateriflora*; with reputed properties as a tonic nervine in tremors, chorea, hysteria, etc. Dose, of the fluidextract, 10 to 30 minims.

SEA-BATHING.—Sea-bathing may be regarded as a powerfully stimulating cold-water bath, from which it differs only in the action of its ingredients. A question often asked is: Does sea-bathing differ from a salt-water bath taken elsewhere? It differs in the admixture of organic and inorganic mechanic particles in the water; in its varying degree of wave-motion; and in producing an effect, otherwise unattainable, by the alternation in exposure of the body to water and to air. Sea-water is more equable in temperature than the surrounding air, and is, as a rule, warmer in winter and cooler in summer than other water. Its temperature varies during the day and from day to day, but in a less degree than air. Sea-water holds in solution an amount of salts varying according to locality. Mediterranean water is richest in salt. The waters of the Baltic Sea are less salty, containing about 0.5 percent. Five-sixths of the salts in sea-water consist of sodium and magnesium chlorids. The sulphates and carbonates of calcium, magnesium, and potassium constitute the principal other salts. Artificial salt baths cannot give the motion of sea-water, which varies constantly and according to the size and force of the waves; and the effect of sea-bathing is to a great degree dependent upon this point. Waves in any degree powerful expose the upper part of the body to their coming, and the lower part to their receding; and cutaneous nerves are not only influenced by the temperature, but also by the force of the water and of other substances, such as sand, mixed with it. The alternate exposure to air and water occasioned by waves is peculiar to sea-bathing, and produces its impression on the cutaneous nerves.

The time of day for sea-bathing depends on the weather, the season, the individual, and the tide. As a rule, it is inadvisable to bathe when the stomach is empty, and never after a full meal. Delicate persons particularly should be warned on these points. The duration of a bath is to be measured by the constitution of the bather, the force of the waves, and the temperature of the water. Five minutes are sufficient for weakly persons, while immersion for 1 or 2 minutes may suffice. A good rule is to leave the water as soon as reaction manifests itself.

The warm sea-bath is to be recommended with advantage when the cold sea-bath is unattainable. Such baths are analogous to warm, common-salt baths. The tepid swimming bath of sea-water is sometimes appropriate, can be used in winter, and offers the advantage of combination with muscular exercise. The physiologic effect of sea-baths is similar to that of sea-air. The usual effects are increased appetite and increased weight of body. When loss of appetite, headache, digestive disturbances, and loss of weight ensue from sea-bathing, the shock of the bathing is too great, or the baths are too long continued or too frequently taken, or possibly the increased demand upon the system is too great.

There are cases unsuited for sea-bathing. Persons affected with certain diseases of the heart (see SCHOTT TREATMENT, HEART-DISEASE (Organic)), diseases of the blood-vessels and lungs, angina pectoris, epilepsy, organic diseases of the nervous system, enlargement of the liver, or other organic disease of the abdominal viscera should avoid bathing in the open sea. Violent palpitation and dyspnea extending over many months may ensue, as well as general sleeplessness, loss of appetite, and emaciation. Except on warm days and in quiet water, old persons, especially those with feeble circulation, should avoid bathing in the open sea. Recent rheumatic joint affections are injured by sea-bathing, and it is hazardous in cases of chronic pneumonia, with pleuritic effusion, and in tuberculosis of the lungs.

Cases benefited by sea-bathing are those with weakness or atony of the skin—*e. g.*, with a tendency to profuse perspiration, and who take cold easily on exposure to winds or drafts. In scrofulous complaints there is often more advantage in sea-bathing than in climatic treatment. In muscular rheumatism sea air, combined with the moderate use of sea-bathing, is most useful. So-called nervous rheumatism is often benefited by the use of gentle sea-bathing. Functional diseases of the nervous system are much benefited by sea-baths adapted to the individual case. Persons with a tendency to neuralgia, to nervous asthma, or to certain forms of hysteria are often unable to stand sea air for a long period of time.

According to Kruse, the prevalent objections to sea-bathing in anemia are not justified. The untoward results are attributable to the injudicious employment of the baths. Lack of care in cold bathing is accountable for acute cardiac dilatation, additional weakening of the heart-muscle, which in anemia is less vigorous than normally, and which explains the faintings, weaknesses, etc., after prolonged baths.

Cold sea-baths are contraindicated in anemia complicated with diseases of important organs, such as ulcer of the stomach, chronic inflammatory processes in the uterus and its appendages, etc., or in anemia which has led to great debility and anorexia. The latter is soon relieved by sea air.

The following rules are recommended:

1. Anemic patients should not bathe for two days after arrival at the seashore.
2. They should never bathe when fasting.
3. They should not take baths every day.
4. The first baths must not last over 1 minute; later on they may be extended to 3 or 4 minutes, but never longer.
5. The bather should undress rapidly and dip into the waves immediately, without waiting for the body to cool.
6. The patient should not move about, but remain as passive as possible while in the water.
7. No baths are to be taken in stormy weather, to avoid overexertion.
8. After each bath the skin must be carefully dried and rubbed.
9. The patient should not exercise, but should rest in bed for an hour after each bath.
10. As a rule, anemic patients should not bathe oftener than every second day.
11. No object is attained by beginning the sea-bath treatment with warm baths. They may do harm. An exception to this rule is in parametric exudations; in these warm sea-baths may be used, with warm wet packs on the abdomen during the night, associated with abdominal massage. These, together with prolonged stay in the sea air, prove efficacious.
12. The patient should not exercise much at the seashore; even sitting there for an occasional hour proves sufficiently tiring.
13. Patients with profound anemia should limit walking to the absolutely necessary; they should sit or lie, well wrapped, in the open air for the greater part of the day.
14. The insomnia that often sets in while at the seashore is most frequently due to overexertion.
15. Preparations of iron assist, especially in the beginning, and are in most instances well borne at the seashore. The most desirable form is saccharated ferric carbonate; but the use of ferruginous waters at the seashore is not appropriate in anemias.
16. The patient should not yield to the extreme appetite which often sets in at the seashore, lest the stomach soon become unable to perform its functions.
17. Alcoholic stimulants should be used most sparingly; patients should be warned against brandy and heavy wines. Alcohol promotes fatty degeneration of the muscles, and particularly of the heart.

Three hundred cases treated by Kruse with the above precautions proved the efficacy of sea-baths in anemia.

Many states of weakness manifesting themselves in various ways unsuitable for classification, such as inability to sustain mental or bodily efforts, tendency to abortion, leukorrhea, etc., are greatly benefited by judicious and well-timed sea-bathing.

The fear of sea-bathing during menstruation is a teaching handed down to us from by-gone generations. However, any healthy woman may bathe in moderately warm water during menstruation, if she takes proper precautions against subsequent cold. Mirouiff states that alkaline baths at 27° or 28° C. during menstruation by patients suffering from gynecologic troubles act as excellent sedatives. Moreover, the quantity of blood lost is not increased or affected, save possibly to be slightly diminished. In addition, pain is soothed and any accompanying inflammation of the genitals mitigated. Salt baths are, therefore, of real benefit during the flow. Sea-baths, far from deranging, favor menstruation. Unless there is grave uterine disease, sea-baths prolong the period of sexual activity and increase fruitfulness.

SEA-SICKNESS.—The nausea and vomiting affecting certain persons at sea, or those who are subjected to any undulating motion, like that of a vessel.

Etiology.—The exact cause of the condition has never been definitely settled. Very likely no one cause is active in every case. Cases seem divisible into those primarily of nervous origin and those of gastric origin. Imagination alone may cause mal de mer. Disturbance of equilibrium and exaggerated conceptions of the relationship of space, may result in nausea and vomiting. Eye-strain may be provocative of an attack. Some believe that sea-sickness is due to hyperemia of the semicircular canals; others that it results from disturbance of the endolymph. Congestion of the cord and medulla is also regarded in the etiology. The same phenomena may be caused by swinging or by traveling, and even by landing after voyaging. An important point to bear in mind is that the mere fact of a patient's being on a vessel does not preclude the possibility of volvulus, appendicitis, intestinal obstruction, or other complication requiring prompt and urgent attention.

Treatment.—In genuine sea-sickness the bromids furnish a means of prophylaxis. From 5 to 10 grains should be given 3 times daily for several days before sailing. After sea-sickness has begun, they are best given in an effervescing mixture—*e. g.*:

℞.	Citric acid,	ʒ ij
	Distilled water,	ʒ iv.

Mix and add:

℞.	Potassium or sodium bromid,	ʒ j
	Potassium bicarbonate,	ʒ j
	Distilled water,	℥ iv.

Take a tablespoonful of each and drink while effervescing.

Bromural is highly recommended as a prophylactic.

For an hour before embarking strychnin sulphate, arsenate, or hypophosphite, 1/120 grain, may be taken every quarter of an hour; or the combination of 1/120 grain of each of above compounds of strychnin may be taken for 3 days, 3 times daily, with 1/2 grain of podophyllum each night.

For 3 days before sailing, and for 3 days thereafter take:

℞.	Extract of taraxacum, Compound extract of colocynth,	each,	gr. xx
	Extract of hyoscyamus,		gr. iij
	Extract of nux vomica,		gr. v
	Mass of mercury,		gr. xv.

Divide into 20 pills. Take 1 or 2 each night.

The diet must be simple and fluids must be avoided. The recumbent posture should be kept upon deck.

For the vomiting of sea-sickness 5 drops of a 4 percent solution of cocain may be given 3 times daily; or—

℞.	Chloroform, Tincture of nux vomica,	each,	gtt. x
	Compound tincture of lavender,		ʒ j
	Water,		℥ x.

A teaspoonful every hour until the vomiting and nausea cease, the bottle to be shaken each time a dose is given.

Chloral, amyl nitrite, nitrogylcerin, and antipyrin may also be mentioned as useful. A spinal ice-bag may relieve the headache.

From many years' experience, P. K. Taylor makes the following summary of the treatment: Rely chiefly, in nervous cases, on morphin and atropin, given by preference hypodermically; and on calomel and Rochelle salt for disturbed digestions. Bromocaffein will often relieve the headache, and cocain will sometimes be of great benefit in overcoming nausea, if given by the mouth. Avoid the bromids of potassium and sodium, as they do more harm than good, by upsetting the digestion. A belladonna plaster over the nape of the neck and a large capsicum plaster over the epigastrium will often be all that is needed to secure immunity from headache and nausea. If, when the ship is pitching much, a person instinctively holds his breath as he sinks to the hollow of each wave, insist on his "breaking step," so to speak. A determined effort to breathe regularly, and not in rhythm with the motion of the vessel, will quickly be successful in overcoming a muscular contraction of the diaphragm which, unchecked, would speedily lead to emesis. As regards diet, it is best to let patients choose for themselves to a great extent; that suited to one patient may not be tolerated by another. Liquids should be restricted in amount. Solids, like toast or dry unsweetened biscuit, with a little iced champagne or brandy and ginger ale, are less likely to be rejected by the stomach than are the usually administered beef-tea and chicken broth. Do not insist too much on the value of fresh air on the deck. A day or two in bed with restricted diet is sometimes of more benefit than fresh air secured at the expense of one's reserve fund of energy. When there is an opportunity to advise prospective voyagers, always insist on careful diet for several days before going to sea; and upon a liberal calomel and saline purge about 48 hours before sailing. See CALAGE.

SEA-WATER INJECTIONS.—Sea-water especially collected and prepared carefully with aseptic precautions is injected preferably behind the great trochanter in adults, in infants over the scapula. Marked and rapid tonic effects are reported by the French advocates of this treatment as regards the bodily functions and general condition. This treatment is said to be valuable in gastro-intestinal disorders, especially in infants, in skin diseases, in varicose ulcers, anemia, chlorosis and tuberculosis, etc. The initial doses are generally 20 to 50 c.c., depending on the disorder. The results obtained are discredited by American observers who have found this treatment of no greater value than simple injections of normal saline solution.

SEBACEOUS CYSTS.—These are most common during middle life, and occur on any portion of the body, though most generally upon the scalp, back, shoulders, and face. They are mostly movable, superficially situated, and adherent to the skin. The contents are usually of yellowish, curdy material. They probably are formed by dilatation of a hair follicle, with sebaceous secretion. If untreated, they frequently become inflamed, suppurate, and occasionally calcify. Papillomata, horns, and epitheliomata may arise from their internal surfaces. Sebaceous cysts are to be differentiated from dermoid cysts, which lie under the deep fascia, the skin being freely movable over them; a sebaceous cyst lies in the corium, and moves with it or is adherent to it.

Treatment.—Sebaceous cysts should be removed before they become inflamed, by a linear incision through the skin down to, but not into, the tumor, separating the cyst with the scalpel-handle from the connective tissue surrounding, and removing without evacuating the contents. In any case, the cyst-wall must be removed. Fatty tumors are sometimes mistaken for sebaceous cysts or wens, but the treatment is the same in either case, and a distinction is immaterial.

SEBORRHEA (Dandruff; Pityriasis).—A disorder of the fat-producing glands characterized by an increased and altered secretion of sebum, producing an oily or scaly condition upon the skin.

Symptoms.—There are two forms—*seborrhœa oleosa* and *seborrhœa sicca*.

Seborrhœa Oleosa.—This form manifests itself as an inordinate oiliness of the skin. The parts usually affected are the forehead, cheeks, and nose. The mouths of the follicles are dilated, and there is often an enlargment of the superficial blood-vessels. The face is dirty and begrimed, owing to the adhesion of particles of dust to the skin.

Seborrhœa sicca (dandruff) manifests itself as an accumulation of yellow or grayish scales, occurring upon the scalp or nonhairy regions. When the face is involved, the eyebrows and beard are usually affected first.

Upon the scalp this condition is generally associated with falling of the hair (*defluvium capillorum*).

The *vernix caseosa* is an intrauterine seborrhea, physiologic in character. The *smegma præputii* is also a seborrhea. As a result of the decomposition of the secretion, balanitis sometimes develops

Etiology.—The causation is obscure. The disease occurs most frequently at the age of puberty. It is more common in women than in men, and in dark-complexioned persons than in blonds. It may be idiopathic, but is frequently met with in persons affected with tuberculosis, chlorosis, general debility, and gastrointestinal disorders.

Diagnosis.—Oily seborrhea can scarcely be confounded with any other affection. Seborrhœa sicca is to be distinguished from psoriasis, eczema, erythematous lupus, and ringworm. These are all characterized by redness and by more or less thickening.

Pathology.—There is overaction of the sebaceous glands and of the sweat-glands, at times accompanied by a slight degree of inflammation. Some observers consider the affection as microoganismal in character.

Prognosis.—Favorable. Long-standing cases affecting the scalp lead to baldness.

Treatment. Constitutional.—Tonics, such as arsenic, iron, strychnin, and quinin are often indicated. Duhring recommends calcium chlorid in doses of 1/10 to 1/5 grain. Gastrointestinal disorders should receive appropriate treatment.

Local.—The indications are first to remove the crusts and scales, and then to use stimulating and astringent applications, with a view to favorably influencing the glandular secretions. Resorcin, sulphur, and salicylic acid are the three sovereign remedies.

To soften adherent crusts upon the scalp:

℞.	Salicylic acid,	gr. xx
	Olive oil,	℥ iv.

This may be followed by the use of the tincture of green soap to remove the epithelial debris. One of the following preparations may then be employed:

℞.	Resorcin,	ʒ jss
	Castor oil,	♏ xx
	Alcohol,	℥ iv.

(If an aqueous lotion is required, the castor oil and the alcohol may be replaced by glycerin and water.)

℞.	Fluidextract of pilcocarpin	℥ j
	Tincture of cantharides,	℥ ss
	Soap liniment,	℥ ijss.

Rub the scalp well with this lotion daily.

℞.	Sulphate of quinin,	ʒ jss
	Rectified spirit of wine,	℥ iv
	Tincture of capsicum,	each ℥ ss
	Tincture of cantharides,	
	Aromatic spirit of ammonia,	
	Glycerin,	℥ iv
	Water, enough to make	O j.

Apply locally.

Upon nonhairy regions, or when there is but little hair upon the scalp, salves may be used:

℞.	Precipitated sulphur,	gr. xx to xxx
	Petrolatum,	℥ ss
	Oil of bergamot,	♏ xx.

Or—

℞.	Salicylic acid,	gr. x
	Petrolatum,	℥ ss.

Ammoniated mercury, calomel, carbolic acid, and other remedies are also employed, but the foregoing will be found to give the best results.

For oily seborrhea use equal parts of alcohol and ether.

Or—

℞.	Boric acid,	gr. xxx to ʒj
	Alcohol,	℥ ij.

Or—

℞.	Tannic acid,	gr. xxx to ʒj
	Alcohol, each,	℥ j
	Water,	

SECALE.—See Ergot.

SECTION.—See Abdominal Section, Cesarean Section.

SECUNDINES.—The placenta, cord, and membranes expelled from the uterus after the birth of the child. For their management, see Labor.

SEDATIVES.—Agents that exert a soothing influence on the system (or upon a part) by lessening functional activity, depressing motility, and diminishing pain. *General sedatives* include the narcotics and anesthetics, while *local sedatives* include aconite, opium, ice, etc. *Pulmonary sedatives* are hydrocyanic acid, veratrin, the nauseants, and the emetics. *Spinal sedatives* are physostigma, gelsemium, and potassium and sodium bromids. *Stomachic sedatives* include arsenic, bismuth, silver nitrate, and sodium bicarbonate. *Vascular sedatives* are digitalis, tobacco, aconite, veratrum, and the emetics. Among *nervous sedatives* are potassium and sodium bromids, tobacco, lobelia, and the group of spinal depressants. *Constitutional sedatives* overlap therapeutic divisions. The type is distinctly narcotic and anesthetic. Of *local sedatives*, cold, in the form of ice or ether spray, deadens the sensibility of the skin. Aconite, opium, cocain, belladonna, veratrin, and blisters soothe the sensory nerves and influence the circulation of the parts. The local sedatives are useful in rheumatic or neuralgic pain, in superficial inflammation, and to allay itching in prurigo, eczema, and skin affections. Diluted hydrocyanic acid, carbolic acid, chloroform, borax, and chloral hydrate are examples.

SELF-ABUSE.—See Masturbation.

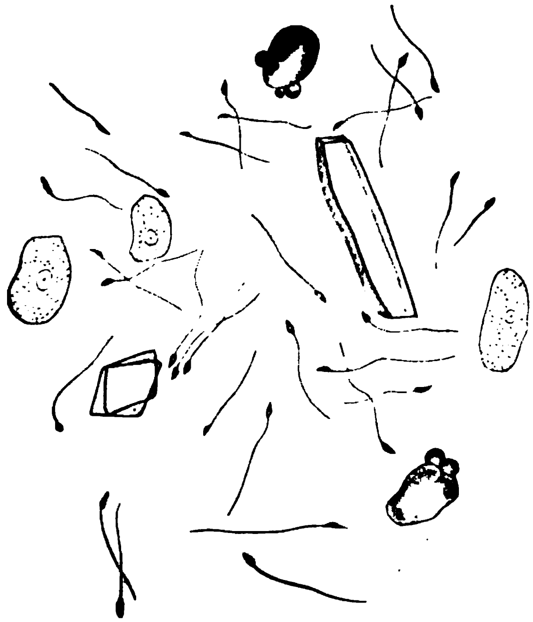
SEMINAL EMISSIONS.—See NOCTURNAL EMISSIONS.

SEMINAL STAINS.—In all cases of alleged rape the underclothing of the victim should be carefully examined for seminal stains, which stiffen the fabric on which they are deposited in the same way that gum or albumin does. Moistened with warm water, seminal stains give off a characteristic odor.

Lassaigne's test for semen is as follows: The seminal stain is moistened with a solution of lead oxid in liquor potassæ and dried at 68° F. There is no yellow color developed, as would occur in albuminous fluids. However, semen diluted with an albuminous secretion develops a yellow color.

The only positive proof, however, of semen is the discovery of spermatozoa by microscopic examination. A drop of mucus from within the vagina may be placed upon the slide, or the stains may be dissolved and mounted.

The old method of soaking and washing a fabric for seminal discharges often gives unreliable results. The following rules for the microscopic examination of supposed seminal stains are offered by Hamlin:

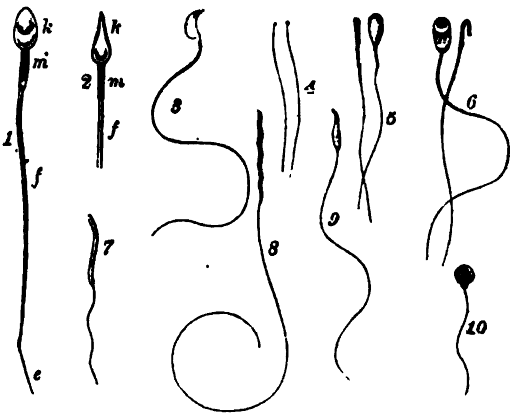


NORMAL SEMEN.—(*Webster.*)

If the stain is upon any thin cotton, linen, silk, or woolen fabric, cut a piece about 1/8 inch square, lay it upon a slide previously moistened with a drop of water, and let it soak for half an hour or so, renewing the water from time to time as it evaporates; then, with two needles, unravel, or fray out the threads at the corners, put on the glass cover, press it down firmly, and submit to the microscope. If the fabric is of such thickness or nature that it cannot be examined in this way, fold it through the center of the stain, and with a sharp knife shave off the projecting edge thus made, catching upon a slide moistened with water the particles removed. After soaking from 5 to 10 minutes, the powdery mass will sink down through the water and rest upon the slide. The cover-glass may now be put on and the preparation examined. This latter method will serve well for semen on hairs. A circle of marine liquid glue run around the cover-glass will temporarily preserve the specimen. Carbolic acid or chloral hydrate may be added to the water, as a preservative.

A spermatozoon resembles somewhat the flagellate infusoria. It consists of an ovoid head tapering into a filamentary appendage, or tail, about 10 times as long as the head that, in fresh specimens, vibrates with astonishing rapidity. Spermatozoa vary in number and size, measuring, on an average, between 1/600 and 1/500 inch. The only living animalcule that might be mistaken for a spermatozoon is the trichomonas vaginalis, occasionally found in the vaginal mucus of unclean females. It, however, has a large ciliated head and a shorter tail.

The remarkable vitality of human spermatozoa is a well-recognized fact. The movements of the spermatozoa may be observed for as long as 72 hours at a suitable temperature. Piersol remarks that at a tempreature of 8.5° C. a few of the elements showed movement after being kept for 9 days. These facts have certain medicolegal bearings.



SPERMATOZOA.—(*Landois.*)

1. Human (× 400), the head seen from the side. 2. On edge. *k.* Head. *m.* Middle piece. *f.* Tail. *e.* Terminal filament. 3. From the mouse. 4. From bothriocephalus latus. 5. From the deer. 6. From the mole. 7. From the green woodpecker. 8. From the black swan. 9. From a cross between a goldfinch and a canary. 10. From cobitis.

SENEGA.—The dried root of *Polygala senega* (called also Seneca snakeroot), with properties due to a glucosid, senegin, which is identical with saponin, and closely allied to digitonin. Dose, 10 to 30 grains. It is expectorant and diuretic; in large doses a gastrointestinal irritant, and is useful in bronchitis, asthenic pneumonia, asthma, etc.

Preparations.—**S. Fluidextractum.** Dose, 10 to 30 minims. **S. Syrupus.** Dose, 1 to 2 drams. **Syrupus Scillæ Compositus,** contains 8 percent of senega.

SENNA.—The dried leaflets of *Cassia acutifolia* and *C. angustifolia*. Senna contains an amorphous glucosid, cathartic acid; other constituents are sennapicrin, sennacrol, cathartomannit, and chrysophanic acid. It is an excellent cathartic for children and infants. Senna acts chiefly on the small intestine, is not irritant in medicinal doses, and leaves no after-effect. However, it may cause hemorrhoids and hemorrhagia, if long continued. Its odor and taste are disagreeable, particularly in infusion. The least disagreeable of its preparations are confection of senna and compound licorice powder.

Preparations.—Fluidextractum S. Dose, 10 to 60 minims. **Syrupus S.,** has of the fluidextract 25, oil of coriander 1/2, syrup to 100. Dose, 1/2 to 2 drams. **Confectio S.,** has of senna 10, cassia fistula 16, tamarind 10, prune 7, fig 12, sugar 55 1/2, oil of coriander 1/2, water to 100; is sold under the trade names *Tamar Indien*, and *tropical fruit laxative*. Dose, 1/2 to 2 drams. **Infusum S. Compositum,** *black draught*, has of senna 6, manna 12, magnesium sulphate 12, fennel 2, boiling water 80, cold water to 100. Dose, 2 to 6 ounces. **Pulvis Glycyrrhizæ Compositus,** *compound licorice powder*, contains 18 percent of senna. Dose, 1/2 to 1 1/2 drams. See GLYCYRRHIZA. **Syrupus Sarsaparillæ Compositus,** *compound syrup of sarsaparilla*, contains 1 1/2 percent of the fluidextract of senna. Dose, 1 to 8 drams. See SARSAPARILLA.

SENSATION, DISORDERS.—These affect nerves of special or common sensibility, the lesion being either in the end-organ, in the afferent or efferent nerve, or in the ganglionic nerve-center. The sense of touch comprises the sensations of contact, pain, temperature, and muscular activity.

Hyperesthesia, as commonly understood, expresses increased sensibility only to painful impressions, and is better called hyperalgesia. The affected skin is sometimes so tender that a light touch will produce more or less exquisite pain, and the hyperesthesia is usually associated with excess of sensibility to heat and cold and a diminution of the sensibility to touch proper. In gunshot wounds of the nerves it is seen in its most severe form. Hyperesthesia is observed in connection with peripheral and central diseases of the nervous system, and is an accompaniment of neuritis; it is usually expressed in heightened sensibility to temperature.

Treatment.—The lesions causing the expression of perverted function must be discovered and treated. Local moist heat, as by fomentations or poultice; cold, by means of ice; dilute veratrin ointment, atropin ointment, or hypodermic injections of morphin, may mitigate the condition. Spongiopilin sprinkled with a liniment of chloroform and belladonna (1:3), or equal parts of ether, volatile salt, laudanum, and cologne water, may be applied. Lint soaked in chloroform and covered with oiled silk, or rubbing the part with camphor-chloral and vaselin in equal parts, may suffice.

Anesthesia may result from local abstraction of heat or from exposure to cold. Handling soda used in laundries and the various chemicals used in the arts may induce anesthesia. In herpes zoster the skin between the groups of vesicles is often anesthetic. In leprosy the senses of temperature and of pain are often abolished. Pressure upon sensory or mixed nerves, as by syphilitic tumors or other growths, may produce anesthesia. Simple mechanic pressure will often excite an inflammation that is followed by anesthesia of the distributive area. Trauma may cause pain followed by anesthesia. Severe nervous trophic disorder is usually associated with anesthesia. Before attacks of neuralgia the skin of the part surrounding is anesthetic; and during attacks of sciatica, and in cervicobrachial neuralgia, there is much diminution of tactile sensibility.

Approaching hemorrhage is often heralded by cutaneous anesthesia. Sudden and increasing numbness in one side of the face or in the limbs of one side may be shortly followed by apoplexy or coma. This anesthesia remains as a subjective feeling of numbness, but the extent bears no relation to the amount of motor paralysis. Recovery proceeds downward, the fingers retaining slight anesthesia for some time after the arm is restored to normal sensation. Cerebral tumors, abscesses, or lesions of the spinal cord or of its membranes may give rise to cutaneous anesthesia. Cutaneous anesthesia affecting the soles of the feet occurs in tabes dorsalis.

It is extremely important to remember that cutaneous anesthesia connected with spinal disease is likely to result in bed sores and in trophic and vasomotor nerve affections. In peripheral neuritis anesthesia is of frequent occurrence. Auræ are often manifested by spots of local anesthesia.

Loss of the sense of muscular activity is especially noticeable in locomotor ataxia. It also occurs in general paresis, in hemiplegia, and in hysteria. As to diagnosis, the most important consideration is whether the causative lesion or disease is central or peripheral.

Treatment.—This is bound up with the treatment of the underlying cause. When the sensory nerves fail to conduct impressions for some time after the lesions that caused the anesthesia have healed, electricity, derived from an induction machine or the negative pole of a continuous-current battery may be employed. Static electricity is a valuable means of combating anesthesia of this kind.

Paresthesia.—The varieties of this disorder are very numerous. Heat may be felt as cold: a faradic current (intolerable to the healthy) may be felt as cold; pricks or pinches may be felt only as touches; feelings of burning, numbness, tingling, creeping of ants, or actual numbness are other manifestations. The senses of contact, pain, and temperature may be in abeyance. Movements may be guided by the muscular sense aided slightly by sight, etc.

SEPSIS.—**Sepsis,** or "blood poisoning," is a term used to designate sapremia, septic intoxication, septicemia, and pyemia. The former two are due to the presence of toxins alone in the blood (*toxemia*), and the latter two to the presence of toxins and bacteria (*bacteremia*). These toxins and organisms may be of any variety, but in the following paragraphs the terms septic intoxication and septicemia are defined in their restricted sense as referring to pyogenic toxins and pyogenic bacteria.

Sapremia is due to the absorption of the products of putrefaction; hence, properly speaking, autointoxication from decomposing intestinal contents is sapremia. Saprophytic organisms are rarely found alone in surgical affections, consequently a pure form of sapremia is rarely seen. The best example is that due to the absorption of ptomains from a decomposing placenta after childbirth, although a more or less pure form may be seen as the result of putrefaction of blood clots, wound secretions, or large tumors. Since sapremia is so frequently linked with other septic processes, and is clinically indistinguishable from septic intoxication, the term should be discarded.

Septic intoxication (*pyogenic toxemia*) is due to the absorption of pyogenic toxins. The usual cause is pus under pressure, *e. g.*, an unopened abscess or a badly drained, suppurating wound. As granulation tissue blocks lymphatic spaces, toxins are not readily absorbed from its surface, unless pressure be added; thus in a completely drained abscess there are no constitutional symptoms; if the drainage be defective, however, or if the lymph spaces be opened by curettage, absorption takes place. *Chronic septic intoxication* is hectic fever.

The **symptoms** appear usually in from one to three days, and vary in degree according to the character and virulence of the toxin, the amount of absorption, and the resistance of the individual. They manifest themselves as *fever*, or *pyrexia*, which is a syndrome characterized by a rise in temperature (often preceded by a chill), quickening of the pulse and respirations, headache, backache, diffuse muscular soreness, general weakness; by disordered secretions, causing dryness of the mouth, coating of the tongue, thirst, impaired appetite (sometimes vomiting), constipation or diarrhea, scanty high colored urine containing an excess of urea and urates, dryness of the skin or sweating; and by nervous disturbances varying from delirium to coma. There is a leukocytosis unless the intoxication is slight or overwhelming, but no organism in the blood. In the young and robust the symptoms are apt to be active (*sthenic fever*); in the debilitated, in the old, and even in the young (when protracted), they are apt to be of a low type and associated with marked exhaustion (*typhoid state, asthenic or adynamic fever*). The *local symptoms* are those of inflammation, and, if there be a wound, usually a copious and foul smelling discharge.

Septicemia (*pyogenic bacteremia*) is septic intoxication plus the presence of living pyogenic bacteria in the blood stream, and differs from pyemia only by the absence of secondary abscesses. The organisms gain entrance to the blood by the lymph vessels as the result of pressure in an abscess (*secondary septicemia*), or possibly in some cases pass directly into the open capillaries without the existence of suppuration (*primary septicemia*). *Cryptogenic septicemia* presents no wound or focus of suppuration; a forgotten needle puncture, or an abrasion on the skin or one of the mucous membranes may be responsible for these cases, which become fewer as the surgeon increases in experience and investigates with more care. Bacteria in the circulating blood are devoured by the leukocytes, or dissolved by the bacteriolytic action of the blood serum, thus terminating the process; or, if sufficiently numerous or virulent, and especially if the individual has not sufficient resistance to manufacture antibacterial serums or opsonins, they multiply, continue to elaborate toxins, and are distributed to various parts of the body, where they may cause secondary or metastatic abscesses (pyemia); some are eliminated by the excretory organs, and some are destroyed by the tissue cells. There is no specific microorganism of septicemia, any one of the pyogenic bacteria seemingly being capable of producing the condition, although the streptococcus bears the worst reputation in this respect.

The **symptoms** may be noticed a few hours after a wound, or not for several days. There is usually a chill, with a rapid rise in temperature to 104° or 105° F.; the fever persists, being less in the morning and greater in the evening; in many cases there are violent chills at irregular periods, followed by high temperature and drenching sweats. The pulse increases in rapidity and decreases in tension. In severe cases the pulse rate reaches 150 or more, finally becoming so rapid and weak that it cannot be counted. There is often marked depression of the nervous system, the patient being stupid and quiet (typhoid state); or delirium, restlessness, picking at the bed clothes and twitching of the tendons; in either case coma precedes death. Although the respirations are quickened, signs of imperfect oxygenation of the blood are often seen in the face, which may be cyanotic. The tongue is dry, coated, red at the edges, pointed at the tip, and sordes are present upon its dorsum and upon the lips. There are loss of appetite, occasionally vomiting, often diarrhea. Petechiæ may appear in the skin and mucous membranes, and, owing to the disintegration of red blood cells, hematogenous jaundice may develop. The skin may present eruptions also in the form of vesicles or pustules, or simulating urticaria, measles, or scarlet fever. The urine is scanty, high colored, and contains albumin, toxins, and frequently bacteria; the spleen and often the liver are enlarged, and there may be leukocytosis. Bacteria may be discovered in the blood by cultural methods.

The **local manifestations** vary from slight inflammation to the graver forms of cellulitis and are not always characteristic, although in many cases the wound discharges a thin pus, while the activity of the lymphatic vessels is shown by red lines of lymphangitis running to the nearest lymph glands, which are swollen and tender, or even suppurating. The veins about a suppurating wound may become inflamed, and blocked with coagulated blood (thrombophlebitis). Bacteria may invade and soften this thrombus, portions of which may be washed into the blood stream as emboli.

Pyemia is septicemia plus secondary or metastatic abscesses, due to the bacteria lodging in various parts of the body, or to septic emboli the result of a thrombophlebitis; these abscesses may be found in any part of the body, but are most frequent in the bones, where bacteria are readily deposited from the capillaries owing to the slowly moving blood current, and in those organs which have terminal arteries, such as the brain, spleen, kidney, and lung. Emboli arising in the area drained by the portal vein lodge in the liver. Compared with preantiseptic days, pyemia is comparatively rare at the present time, but is especially prone to follow thrombophlebitis of the facial veins in infections in this neighborhood, thrombophlebitis of the lateral sinus the result of middle-ear disease, and pylephlebitis the result of inflammations about the rectum, appendix, etc.

The symptoms are those of septicemia, plus the secondary abscesses, which usually appear during the second week; they are generally announced by an additional chill, but may develop insidiously, sometimes without even pain or tenderness, and they are commonly small and multiple. Pyemia may run its course in a few days (*acute pyemia*), or it may last a number of months (*chronic pyemia*). It is usually fatal, although recovery has occurred despite the presence of secondary abscesses in the internal organs. In pyemia there is said to be a characteristic sweet odor not unlike that of hay.

Surgical scarlatina is the name given to the scarlet rash, probably the result of vasomotor disturbance, seen in cases of sepsis. True scarlatina may, however, occur after operations and accidental wounds, especially in children. Since the period of incubation is shorter than in the nonsurgical form, it may be that the microorganism of scarlet fever enters through the wound. Scarlet rashes may occur likewise from the absorption of ether, bichlorid of mercury, carbolic acid, and iodoform.

The diagnosis of sepsis is made by finding the causative lesion and excluding other febrile maladies. The *causative lesion* is sometimes difficult to locate, particularly in the so-called cryptogenic or spontaneous form, in which it may be necessary to review the entire body before finding the source of infection. Regions especially liable to be overlooked are the ear, teeth, throat, urethra, rectum, in women the pelvic organs, and in children the bones, particularly the tibia. An insignificant wound that has healed may be the starting point of even the gravest forms of sepsis, and, on the other hand, a wound, even if suppurating, may be complicated by other forms of fever. Here it should be noted that tonsillitis may be the cause, and pneumonia, endocarditis, etc., the result of sepsis. The *exclusion* of aseptic fever is made by the healthy appearance of the wound and the brief duration of the fever, of autointoxication by stimulating the excretory organs. When there is marked depression of the nervous system and general exhaustion, typhoid fever (Widal reaction, leukopenia) and miliary tuberculosis may be simulated, while the occurrence of chills is often wrongly interpreted as malaria; in the last a blood examination will reveal the presence of malarial parasites. The occurrence of skin rashes, particularly in children, will bring up the question of the acute exanthemata, especially measles and scarlet fever. The *form of sepsis* is toxemia (sapremia or septic intoxication) if, in the presence of an inflamed or suppurating wound, the symptoms promptly subside after thorough drainage and disinfection. If the wound does not show evidences of irritation, the constitutional disturbance may be due to septicemia, but is more probably the result of some medical complication. The continuation of fever after the opening of an abscess or wound, excluding medical complications, usually means inefficient drainage, that is, a continuation of the septic intoxication, or, if the wound is perfectly drained, septicemia. In the latter instance, the absorption of bacteria may be evidenced by red and tender lymph vessels coursing along the surface and ending in inflamed lymph glands; the constitutional symptoms are more severe than in septic intoxication, and chills are more likely to occur. A positive diagnosis can be made only by recovery of the organisms from the blood stream, or from the excretions, particularly the urine. Leukocytosis occurs in all forms of sepsis, as does also iodophilia. The diagnosis of pyemia is made by the metastatic abscesses, which, when superficially situated, are easily detected; but when deeply seated in the viscera, they are apt to be small and numerous, and often their presence can only be suspected.

The treatment of sepsis is first *prophylaxis*. All wounds accidentally received should be carefully disinfected and the most scrupulous antiseptic or aseptic precautions taken during operations and the delivery of pregnant women. After labor the placenta should be carefully inspected to make sure that none of it has been left behind, after miscarriage curettage of the uterus is often done with the same end in view. It is important before operations also to increase the resistance of the patient by suitable treatment.

The local treatment is that of the causative lesion, viz., inflammation, suppuration, gangrene, etc. Uncomplicated sapremia or septic intoxication rapidly subsides if the local cause be found and removed. If the symptoms continue, all the putrefying material has not been removed, drainage is not efficient, or bacteria are elaborating toxins in the blood stream (septicemia). In the last the outlook is always grave, although, as has already been indicated, destruction of bacteria and recovery may follow. In pyemia secondary abscesses should be incised and drained, but unfortunately, in the viscera, this is often impracticable owing to their multiplicity. An accessible vein, the subject of thrombophlebitis, should be excised, or (*e. g.*, lateral sinus) opened, the clot removed, and the cavity packed with gauze; in order to prevent the further dissemination of septic emboli, the vein may be tied between the thrombus and the heart; in the extremities amputation may be required.

The general treatment is (1) specific, (2) eliminative, (3) symptomatic. (1) *Specific treatment* aims to destroy bacteria in the blood stream or to neutralize their toxins. Unfortunately, pyogenic bacteria in the blood stream are inaccessible. The *injection of antiseptics* into the circulation, in sufficient strength to be of value, is dangerous. *Antistreptococcic* serum, which at first seemed to give much promise, has been found to be ineffectual; it may, however, be employed in 10 c.c. doses repeated every 3 or 4 hours, particularly if bacteriological examinations prove the infection to be due to streptococci; like diphtheria antitoxin, which, too, has been used in septic conditions without success, it may produce erythematous or urticarial eruptions and pains in the joints, and several cases have been reported in which sudden death followed the injection of the serum. *Vaccine* treatment is still on trial. Quinin, iron, and large doses of alcohol (whisky or brandy) are regarded by many as almost specific in septic processes. (2) The most efficient means of combatting sepsis is by *elimination* of the microorganisms and their products. *Purgation*, especially by calomel and salines, lowers the blood pressure, drains off toxins through the bowel, and clears the intestinal tract of material which may be absorbed and aggravate the symptoms. If nature has anticipated the physician by the production of a diarrhea, such should not be checked unless excessive. *Diuretics*, such as calomel, caffeine, squill, sweet spirit of niter, acetate of potassium, and large quantities of water by mouth or rectum, are of great value in removing toxins from the blood, in lowering temperature, and in reducing blood pressure. When both the stomach and rectum are irritable, the same principle may be utilized by injecting salt solution into the subcutaneous tissues, or, exceptionally, directly into a vein. *Diaphoretics* are not often used, as when they are indicated in septic conditions profuse sweats are generally present. *Venesection* is occasionally employed to lessen the amount of toxin in the circulating blood, especially when followed by the intravenous injection of salt solution. It should never be used in infancy, old age, or in the debilitated. (3) *Symptomatic treatment* depends upon the indications. Rest in bed, predigested liquid food, and proper nursing are always required in severe cases of sepsis. The best *anodyne*, if the condition is to last but a short time, is opium or one of its derivatives. In most surgical inflammations pain severe enough to prevent sleep calls for incision and drainage of the affected part. Nervousness is best met by the bromids, and sleeplessness not caused by pain, by sulphonal or trional. The coal-tar products and chloral, because of their depressing effects, are usually to be avoided. The best *antipyretic* is an ice cap on the head, and general sponging with ice water, or equal parts of alcohol and water; drugs should be rarely employed. Persistent fever usually means that further search for the source of infection, with proper incisions, disinfection, and drainage, should be carried out. In many cases *stimulants*, such as alcohol, strychnin, ammonium carbonate, and digitalis will be needed. (Stewart.) See Suppuration; Colon Bacillus Infection.

SEPTICEMIA.—See Sepsis.

SEPTIC INTOXICATION.—See Sepsis.

SEPTUM, NASAL.—See Nose (Deformities), Rhinitis (Chronic).

SEQUESTROTOMY.—See Bone (Disease).

SERPENTARIA (Snakeroot).—The roots of *Aristolochia serpentaria* and *A. reticulata.* Its properties are due to a volatile oil, a camphor-resin, and a bitter extractive. Serpentaria is a stimulant expectorant and a tonic; also a cardiac stimulant, a diaphoretic, diuretic, emmenagog, aphrodisiac, and somewhat of an antiperiodic. Its taste is warm and pungent, its odor characteristic. Dose, 10 to 30 grains. Large doses are irritant, causing nausea and vomiting, vertigo and headache, colic, borborygmi, rectal tenesmus, flatulent distention, and frequent but not watery stools. The irritant action seems to produce gas rather than fluid. Pruritus ani and hemorrhoids are occasionally caused by its use. Serpentaria is chiefly employed as a vehicle for other stimulant drugs.

Preparations.—S., Fluidextract. Dose, 10 to 30 minims. **S., Tinct.,** 20 percent in strength. Dose, 1/2 to 2 drams. **Compound Tincture of Cinchona** has 2 percent of serpentaria.

SERUM DISEASE.—See Serum Therapy.

SERUM THERAPY. Definition.—The word *serum* is used here in the sense of blood serum obtained from an animal which has been rendered actively immune to some bacterial disease by injecting it with living or killed bacteria or with bacterial toxins. *Convalescent serum,* which will receive brief consideration, is blood serum from a patient who, at the time the serum is drawn, is recovering or has recovered from the disease for the cure or prevention of which the serum is to be used. Such a patient is therefore in a condition analogous to that of an animal which is going through a course of immunizing inoculations. It is to be observed that the administration of a serum for the prevention or cure of a disease acts by producing a *passive immunity* in the injected individual.

Mode of Action.—The use of protective and curative sera is based on the theories of immunity as elaborated by Metchnikoff, Ehrlich and others; or rather, on the general theory of immunity accepted at the present time, which combines the essentials of Ehrlich's lateral chain theory and Metchnikoff's doctrine of phagocytosis. Metchnikoff held that bacteria, and other nonbacterial causes of disease, are devoured by certain cells in the body, notably the leukocytes in the blood, in the same way as the ameba devours the minute organisms on which it feeds. This process he termed "*phagocytosis*," and that it actually takes place can be demonstrated under the microscope. It was soon discovered, however, by Buchner, Nuttal and others that in many cases of immunity there is no demonstrable phagocytosis and that the body juices alone, unaided by cells, possess the power of destroying bacteria (*bacteriolysis*). This doctrine of the bacteriolytic power of the blood serum gradually overshadowed the older idea of phagocytosis and, with certain additions by various investigators, forms the basis of medical thought on the subject of immunity at the present time. Metchnikoff himself modified his original doctrine by assuming the production of enzymes within the leukocytes and their liberation into circulating blood. Later Sir Almroth Wright propounded his theory of "*opsonins*," substances contained in the blood serum which influence bacteria in such a way as to render them susceptible to phagocytosis. According to Wright's theory, the serum of every normal individual is endowed with this "opsonic power" against all bacteria—some more, some less—and, moreover, this opsonic power, or "*opsonic index*," as it is termed, can be influenced by introducing killed bacteria ("*vaccines*") into the circulation. It is now generally held that enzymes, opsonins, alexins, or whatever the protective substance in the blood serum may be called, are capable not only of destroying pathogenic bacteria, but also of neutralizing bacterial toxins. The cells which are believed to possess this bacteriolytic power in the highest degree are the polymorphonuclear leukocytes. *Immunity*, therefore, does not always depend upon the same biologic reactions: it may result from the incorporation and destruction of bacteria by body cells (*phagocytosis*) or from the destructive action of body juices—blood serum, lymph, cerebrospinal fluid—into which the cellular enzymes have been discharged (*bacteriolysis*); or, when the disease is due to the products of bacteria, such as the toxins of diphtheria and tetanus, snake venom, and the like, immunity may depend upon the neutralizing action on the chemical bacterial poison of protective substances (*antitoxin*) contained in the blood.

Ehrlich's lateral chain theory of immunity deserves more extended description. It applies to the mechanism of cellular nutrition in general, and its application to immunity represents only a restricted phase of all the phenomena with which it deals. According to Ehrlich, the cell is equipped with large numbers of *lateral chains*, or groups of combining molecules, an illustration borrowed from the structural diagrams of organic chemistry. These lateral chains are supposed to have specific combining affinities, and it is through the combination of special molecular groups with appropriate groups in the tissue juices that cellular nutrition and metabolism are maintained. Thus, there is no intrinsic difference between the mechanism of normal nutrition and the mechanism of intoxication, clinically manifested as disease. As the needs of different cells vary, so their molecular side chains vary; and certain body cells form combinations with molecular groups in the tissue juices that have no affinity for other body cells. Again, all the cells of one species of animal may have affinities for certain molecular groups (poisons) which, on the other hand, are quite incapable of combining with the body cells of a different species; in such a case the animal, having no suitable side chains, is immune to that particular poison and to the disease which it causes. These lateral chains are called "*receptors*," and the appropriate molecular group in the pabulum with which they combine is known as a "*haptophore*." Cell nutrition or, on the other hand, poisoning of the cells, is effected through a union of receptors with haptophores. In bacterial infections the ability of the bacteria or their toxins to exert a deleterious effect upon the body depends upon their ability to attach themselves to these cell receptors. Such deleterious action may be due merely to the fact that the foreign haptophores supply no useful material and displace the pabulum required by the cell; or, as in the case of bacterial invasion, the haptophores may exert a direct toxic action on the body cells. The toxin molecules are conceived to be composed of two separate groups, of which one, the "*haptophorous*" *group*, is for the purpose of fixation, while the toxic function resides in the poisonous or "*toxophorous*" *group;* the body cells having appropriate receptors—"*haptophilous*" and "*toxophilous*"—through which the respective functions of the toxin are accomplished. Until the haptophore of the toxin has combined with the haptophile of the cell, the toxophore cannot attack the cell body.

The lateral chain theory affords the most plausible explanation of *acquired or active immunity*, a condition brought about by the repeated introduction of minute, nonfatal doses of poison into the circulation. The more frequently the administration takes place, and the greater the quantity of poison administered, the more tolerant the animal becomes to the poison or the disease which it produces. This phenomenon is explained by assuming that the lateral chains or receptors are capable of regeneration for the purpose of supplying the needs of the cell; and if the stimulation is continued long enough, so many side chains or receptors are produced that they are finally cast off by the cell and circulate free in the blood in the form of "*antibodies*" (antitoxin). These antibodies meet and combine with the toxin molecules, neutralizing their toxic action, and so protecting the body cells. When a dose of diphtheria antitoxin is injected into a patient, enormous numbers of antibodies are suddenly set free in the circulation and immediately combine with and neutralize the diphtheria toxin present in the body, and thus produce their protective and curative effect.

Sera are of two kinds: (1) *antitoxic* and (2) *antimicrobic* or *bacteriolytic*. The mechanism of bacteriolysis, like that of hemolysis and cytolysis in general, requires the consideration of certain additional phenomena of immunity, and certain theories to which observation of these phenomena has given rise. Buchner's original observation that the body juices have the power of killing and dissolving bacteria by means of a substance which he called "*alexin*" has been confirmed by subsequent workers. By whatever name it may be called—and it is now generally spoken of as "*complement*"—this bacteriolytic substance is contained in normal blood and is practically indestructible. Whether there are specific complements for different cells—blood cells, bacterial cells, etc.—has not been entirely established, but is probable; the general belief now is that complements, as well as amboceptors, are specific. The complement acts indirectly, like a ferment; thus rennet acts upon caseinogen only in the presence of calcium salts; and, in like manner, the complement, whether universal or specific, acts upon bacteria, blood corpuscles or other cells, only in the presence of another substance—the "*amboceptor*" or "*immune body*." This immune body is variable and specific. Various immune bodies are found in the normal blood of many animals, and different kinds of blood vary greatly in the number and kind of immune bodies which they normally contain. Immune bodies, which may be regarded as identical with the receptors of the body cells, can readily be made to increase by artificial stimulation.

Method of Preparation.—The general method of producing sera or antitoxins as they are loosely called, is as follows: The animal usually selected (on account of the large quantity of serum which it yields) is the horse; although the quantity of active antitoxin produced by individual animals is extremely variable. Moreover, quantity is not the only factor to be considered; and it may well be that, in the future, as the method is further developed, certain animals will be found to be better adapted for the production of one kind of serum than another. As an example, the ram is found to be the most suitable animal for the production of antigonococcus serum. The animal having been carefully selected with reference to its general health and freedom from communicable disease, especially tetanus, increasing doses of toxic bouillon of known strength, obtained from a culture of the specific bacillus against which the serum is to be employed, are injected at intervals varying from a few days to a week, the dose of toxin being increased as rapidly as possible without producing obvious injury to the animal. The time necessary for the production of immunity varies in different animals and with different bacteria; it may be only a few months or very much longer. When a test of the blood shows that it contains sufficient antitoxin, the animal's jugular vein is tapped with a trocar, and as much blood as can be withdrawn without doing harm is received into a sterile container, permitted to coagulate, and the serum drawn off with a pipet. The serum is put up in sealed glass tubes under aseptic precautions, after the addition of an antiseptic to increase its keeping qualities.

Standardization.—Since the immunizing power of a serum is a variable quantity, it is important to determine the strength of the individual output, a process known as *standardization*. The "*immunizing unit*" is that quantity of serum which will protect a given animal, usually a guinea-pig weighing 300 grams, against a certain arbitrarily assumed quantity of toxin. Thus, in the case of diphtheria antitoxin, which may be taken as a typical example, a unit is that quantity of antitoxin which will protect a 300 gram guinea-pig against 100 times the fatal dose of diphtheria toxin. Some manufacturers indicate the strength of the serum in relation to a given number of grams of guinea-pig. In several of the newer sera, however, scientific standardization is impossible, and the dose is purely *empiric*, as in the case of antigonococcus and antistreptococcus serum.

Administration.—Therapeutic serum may be injected *hypodermically*, deep into the *muscles*, *intravenously*, *intradurally*, or applied as *dusting powders* to open wounds. Of these methods, the *hypodermic route* is the one most frequently employed, except with antitetanic and antimeningitic serum. The subscapular region, the abdominal wall, or the inner aspects of the thighs are usually selected for subcutaneous or intramuscular injections, and the usual antiseptic and aseptic precautions necessary with hypodermoclysis or intravenous infusion must of course be observed. Administration by the mouth has been tried, but appears to be ineffective. Since, so far as known, therapeutic sera are absolutely specific, an *exact bacteriologic diagnosis* should precede the administration, whenever the nature of the disease makes this possible.

Serum Intoxication.—The use of therapeutic serum is sometimes attended by certain unpleasant and even alarming symptoms, due probably to the introduction of a foreign serum and not to any specific action of the antibodies contained. It is probable, therefore, that the magnitude of the dose injected bears no relation to the occurrence or severity of such by-effects. In about 20 percent of all the cases in man the injection of serum produces a temporary intoxication in which any or all of the following symptoms may be present: fever, itching, urticaria and other skin eruptions, glandular enlargements, pains in the joints, edema and albuminuria. These symptoms develop in from 8 to 12 days after the injection. They occur after the first injection, whereas anaphylaxis (in animals) manifests itself only after the second injection. Previous injections, however, predispose an individual to "*serum intoxication*" or "*serum disease*," as it is called, in direct proportion to the number of previous injections. The symptoms of serum disease subside in a short time and leave no bad effects.

Anaphylaxis.—Serum disease is not to be confounded with the condition called "*anaphylaxis*" or "*allergie*." If a guinea-pig is injected with a small quantity of horse serum and, after the expiration of a certain interval, is again injected with horse serum, the result will probably be fatal. The first injection has sensitized the animal in such a way as to render it abnormally susceptible to the second injection. Other proteid substances, such as egg albumen, have the same effect as normal serum. Anaphylaxis may be defined as a hypersensitive condition induced by the injection of normal, foreign horse serum or other proteid substance. The hypersensitive condition is manifested after the second injection, separated from the first injection by a certain interval which may be called the period of incubation, and death may sometimes result. The first injection itself produces no symptoms, and, as stated, the condition is not identical with serum intoxication, which develops after a first injection of serum. The very rare instances of sudden death following a single injection of diphtheria antitoxin are sometimes attributed to anaphylaxis, but no sufficient proof in support of this explanation has been furnished. The extreme rarity of the accident—about one case in 400,000 injected with diphtheria antitoxin—would appear to indicate that death is due to some extrinsic cause, such as fright or congenital hypersensitiveness to the trauma of the injection, rather than to any toxic property of the serum, or else to some as yet undiscovered biologic reaction. Diphtheria antitoxin, even in massive doses, is in itself absolutely harmless.

Antidiphtheritic Serum.—See DIPHTHERIA ANTITOXIN.

Antitetanic Serum. Tetanus Antitoxin.

The serum, like diphtheria antitoxin, is a *true antitoxin* and is obtained in a similar way from the blood of horses immunized against the toxins of the tetanus bacillus. It is marketed both in the liquid form and as a powder. Tetanus antitoxin is *specific*, and the only *indication* for its use is tetanus.

Strength and Dosage.—The official unit adopted by the United States Public Health and Marine Hospital Service is "ten times the least quantity of antitetanic serum necessary to save the life of a 350-gram guinea-pig for 96 hours against the official test dose of a standard toxin furnished by the Hygienic Laboratory of the United States Public Health and Marine Hospital Service." Each vial or syringe of tetanus antitoxin made by the American houses contains from 1500 to 5000 units, without regard to the volume of serum, which is about 20 c.c. The unit value per cubic centimeter varies from 150 to 600 units.

Any directions with regard to *dosage* must be purely *empiric,* the only hope of effecting a cure lies in the early and vigorous use of the serum. From one to four vials, each containing 20 c.c., should be given as an initial dose, and the injection repeated every six hours until a reaction is noted; enormous quantities have been employed in desperate cases with apparently curative effects.

Administration.—Five modes of administering tetanus antitoxin are available: by subcutaneous injection; intravenously; intraneurally—into the nerve leading from the infected area; into the spinal canal, or under the dura through a trephine opening; and by dusting the pulverized serum on the infected wound. Of these methods, the subcutaneous is the one most frequently employed; it is easier to carry out, is less painful to the patient, and is apparently as effective as other routes. Powdered serum is used only prophylactically on suspicious wounds.

Prognosis.—The most important factor is the length of the period of incubation; few cases having a period of less than 7 days recover under any treatment. Subacute and chronic cases, and cases in which the period of incubation is longer than a week, give a better prognosis. Numerous recoveries with the antitoxin treatment have been reported, however, and the remedy should be tried in every case. It is estimated that since the introduction of the serum the mortality of tetanus has been reduced about one-half, or from 80 or 90 percent to 40 or 45 percent.

Prophylaxis.—While the curative effect of tetanus antitoxin falls below that of antidiphtheritic serum, the immunizing action of a prophylactic dose, which is given as 5 c.c. or 1500 units, appears to be absolute. For this purpose the *dried powder* is particularly well adapted, and should be used in the case of all suspicious wounds that have been exposed to infection with dust, dirt, garden earth, manure, or any other suspicious substance.

Antivenins.

Antivenin is the serum of an animal, usually a sheep or goat, immunized against the venom of some poisonous snake. As antivenins are specific, they are active only against the venom of the particular species of snake used in immunizing the animal from which the antivenin is obtained.

Snake venoms contain three toxic principles—*neurotoxins*, *hemorrhagins* and *fibrin ferments*. Broadly speaking, *neurotoxins* form the most important constituent in the venom of the cobra and other Indian and African venomous species; while the venom of crotaline snakes, such as the American rattle-snake, copperhead and moccasin snake, produces its poisonous effects chiefly through the *hemorrhagins* it contains. The venom of the Australian serpents contains all three constituents in fairly equal quantities. The neurotoxins of the colubrine serpents cause death through paralysis of the respiratory center, and the bite of these snakes is far more dangerous than that of the crotaline species, which, by virtue of the contained hemorrhagins, produces extensive local destruction, but rarely causes death unless through secondary septicemia. The *specificity* of the various antivenins is now definitely established and has an important bearing on their therapeutic use. Thus, the antineurotoxin of cobra antivenin (Calmette, Lamb) cannot neutralize other toxic constituents of snake venom, nor in fact any other neurotoxin, but cobra neurotoxin. The antihemorrhagin of crotalus antivenin (Flexner and Noguchi, McFarland) is capable of neutralizing only the corresponding hemorrhagins, and in the same way the fibrin ferment of daboia venom, and its hemolytic action, are not affected by the antifibrin ferments of other antivenins.

The following varieties of antivenin are available:

Cobra antivenin (Calmette, Lamb).

Crotalus antivenin (Flexner and Noguchi, McFarland).

Moccasin antivenin (Noguchi).

Lachesis antivenin (manufactured and used in Brazil).

Crotalus terrificus antivenin (Brazil).

Trimeresurus antivenin (Kitashima, Ishizaka).

Daboia Antivenin (Lamb).

Calmette and McFarland use several venoms in the preparation of their sera, which are therefore *polyvalent*, but their action against venoms other than that of the cobra and crotalus is feeble.

Standardization.—The strength of antivenins is determined by injecting animals with a mixture of venom and antivenin, different laboratory animals being selected by various investigators. In the case of daboia venom, which cannot be tested on animals on account of the powerful fibrin ferments contained (hemolysis) standardization is effected by using a mixture of venom and antivenin *in vitro*, or by observing the anticoagulating power on the citrated blood plasma *in vitro*.

According to Calmette's method a standard solution of venom is prepared, the unit of which is based on the quantity of venom necessary to kill a rabbit of two kilograms in twenty minutes by injection into the marginal vein of the ear. This quantity corresponds on an average to 2 milligrams of cobra venom and to 4 milligrams of rattlesnake venom weighed dry. An antivenin, to be sufficiently active for therapeutic use, must be protective in the minimum dose of 2 c.c when injected into the ear vein 15 minutes before the injection of the venom.

Dosage.—Theoretically, the dose should be that quantity of antivenin which neutralizes the maximum quantity of venom that a snake can inject. Thus, from 200 to 350 c.c. of the cobra antivenin prepared by Lamb, and from 100 to 150 c.c. of Flexner and Noguchi crotalus (rattle-snake) antivenin are required to neutralize the maximum quantity of venom that a cobra or rattle-snake is able to inject at one bite under the most favorable conditions. Practically, however, the natural resistance of man to snake venom and the circumstance that the maximum quantity of venom is not invariably injected greatly influence the size of the necessary dose of antivenin. The minimum fatal dose of different venoms for man has been approximately estimated from animal experiments, and it may be stated that the fatal dose of crotalus venom is from 0.15 to 0.20 gram (Noguchi), that of cobra venom from 0.015 to 0.0175 gram (Lamb). As it is only necessary to neutralize the excess of venom over the human tolerance, the administration of a few cubic centimeters of antivenin may suffice to prevent a fatal issue. The bite of the rattle-snake, especially, is rarely fatal. The *average dose* is given as 10 c.c., repeated as often as may seem necessary.

Administration.—Antivenins are administered intravenously or into the muscles. In case of rattle-snake bites it is advised that the serum be injected both intravenously and around the wound (Noguchi). The specificity of the antivenin must always be respected, and early administration is an important factor in the success of the treatment.

At best, the administration of antivenin must be regarded only as an adjunct to other well established procedures, which are summarized by Calmette as follows: (1) If possible, place an elastic ligature tightly above the seat of the bite, so as to prevent absorption of the venom. (2) Inject immediately into the seat of innoculation and in several places about the bite and at no great distance from it, from 20 to 30 c.c. of a fresh 1 percent solution of chlorid of gold or calcium. (3) Remove the ligature and wash the part with a large quantity of a sodium hypochlorite or calcium chlorid solution. (4) As soon as possible administer to the patient, by subcutaneous injection, 20,000 units of antivenin.

Antistreptococcus Serum.

An antimicrobic and bacteriolytic serum obtained from animals immunised against streptococci obtained from various sources. Most antistreptococcic or "streptolytic" sera are *polyvalent*, and some are "*composite*," *i. e.*, they contain diphtheria antitoxin as well as streptococcus antibodies, being obtained from animals previously immunized to diphtheria toxin.

Preparation.—Most of the preparations on the market are polyvalent. In some cases humanized strains of streptococci are employed in immunizing the animals; in others, cultures which have been passed through animals to increase their virulence; sometimes both human and animal strains are used.

One of the earliest antistreptococcic sera was prepared by Marmorek by the immunization of ponies against increasing quantities of living cultures of streptococci, the virulence of which was previously increased by passage through rabbits. Marmorek recommended the serum especially in erysipelas, streptococcus suppuration, puerperal infection and scarlet fever. Aronson's antistreptococcus serum is prepared by immunizing horses against streptococci, cultivated from scarlet fever patients. The dose recommended in scarlet fever is from 20 to 100 c.c. Moser's antiscarlatinal serum, for the preparation of which streptococci were isolated from the hearts of patients who had died of scarlet fever, for a time enjoyed some reputation in the treatment of that disease. Menzer applied the principle of serum therapy to rheumatic arthritis and prepared a serum with streptococci obtained from the tonsils of rheumatic patients.

Some of the methods devised by these investigators have been adopted by manufacturing houses, and sera bearing their names are found on the market. These sera are labeled "polyvalent," "erysipelas," "scarlet fever," "rheumatism," etc., according to the source from which the bacteria used in their preparation are obtained and the purpose for which they are especially intended.

Dosage.—As there is no method of determining the strength of the various antistreptococcic sera, the dose is purely *empiric* and it is customary to inject subcutaneously *from* 10 *to* 20 *c.c.*, and repeat the dose according to indications. As the remedy appears to be free from any harmful by-effects, it may be used fearlessly in very much larger quantities.

Indications.—Antistreptococcic serum has been used principally in *erysipelas*, *puerperal sepsis*, *local streptococcus infections*, *ulcerative endocarditis*, and *general septicemia* when living streptococci are demonstrated in the blood. Special sera, such as Aronson's and Moser's, have been used and warmly recommended by some authors in the treatment of *scarlet fever*. The serum treatment of *rheumatism* also has its enthusiastic advocates. Finally there are reports in the literature of the successful use of various antistreptococcic or streptolytic sera in the treatment of such conditions as gangrenous stomatitis, smallpox, various forms of angina, and pernicious anemia.

Testimony in regard to the value of this remedy is conflicting, and while good results have undoubtedly followed its use in many instances, it does not at the present time enjoy a very high reputation. If it were practicable to use autogenous serum, as in the case of vaccine or bacterin therapy, so as to make certain of the identity of the organism causing the disease with that used in preparing the serum, it is probable that the results would be more uniformly satisfactory. This is, however, for obvious reasons impossible. In a report on the preparations now on the American market, Hektoen, Weaver and Tunnicliffe state that "attempts to obtain protective and curative affects from the injection of antistreptococcic serums in rabbits, guinea-pigs and, on a more limited scale, in mice met with failure. The sera often seemed to reduce the natural resistance and to hasten death. It is our belief that the claims for the usefulness of antistreptococcus serum rest on impressions from results in clinical cases in man, and have in most cases no foundation whatsoever in experimental tests." The burden of proof apparently rests on the clinician.

Antistaphylococcus Serum.

A serum obtained from horses immunized against a mixed culture of *staphylococcus pyogenes aureus, albus and citreus.* It is recommended in the treatment of various staphylococcus infections. The serum appears to have been but little used and has been superseded by the various staphylococcus vaccines.

Antigonococcus Serum.

A bacteriolytic polyvalent serum obtained from the blood of animals immunized against gonococci.

Preparation.—The method employed is that devised by Rogers and Torrey. Cultures are grown for from eighteen to twenty-four hours on large slants (one-inch culture tubes) and, in order to obtain a luxuriant growth, the organisms are transplanted to a medium prepared as follows: Meat, peptone, 2 percent agar are prepared in the usual way and titrated to 1.5 percent acid to phenolphthalein. One part of rich sterile ascitic fluid is then added to two parts of this agar. The animals are inoculated with increasing quantities of virulent cultures grown in this way, after being emulsified in about 30 c.c. of physiologic saline solution and heated for one-half hour to 65° C. Rabbits were at first employed, but the serum was found to be toxic for some individuals and produced some alarming reactions. The same objections were found in a minor degree in goat serum, and the animal finally selected was the full grown, uncastrated *ram*, which is now exclusively used in the production of antigonococcus serum. The immunization requires ten weeks.

The serum is *polyvalent*, cultures of the three principal groups of gonococci being used in its preparation. The selection of these groups is based on agglutination tests, each variety possessing its own specific reaction in this respect.

Standardization.—The agglutination test is a useful index of the therapeutic potency of a serum; one that agglutinates in high dilutions the various strains used in its production, generally proves to be markedly curative. The test itself is only a measure of the degree of immunization, as the agglutinins themselves have probably nothing to do with the curative power of the serum; but in the absence of any direct method of standardization, the agglutination test is of considerable value.

Dosage and Administration.—The conventional dose is 2 c.c. or about 40 minims, repeated every other day or at longer intervals, depending on the reaction obtained and the general condition of the patient. The serum is administered by the *subcutaneous* route; any convenient region such as the abdomen, or the loose areolar tissue in the scapular region or the arm may be selected.

A local reaction, consisting of some swelling, redness, heat and soreness around the point of injection, occurs in most cases.

Indications.—Antigonococcic serum has been extensively used by numerous investigators, and its indications are accordingly better established than is the case with most other therapeutic sera recently introduced into practice. There is fairly general agreement on two points: (1) That the serum is absolutely valueless in all acute gonorrheal infections, and (2) that it is of distinct value in *chronic gonorrheal arthritis*, which is accordingly the most positive indication for its employment. Distinct improvement with relief from pain is noted after the first injection, and not more than from six to ten doses are said to be required to effect a permanent cure. Doubtful results are also reported in subacute and chronic complications of gonorrhea affecting the genito-urinary tract, such as epididymitis and orchitis. On the other hand, *gonorrheal iritis* seems to be favorably influenced by the serum, while in conjunctivitis the results have been disappointing. It is stated that, in general, complications affecting the serous membranes respond to serum therapy, while gonorrheal infections and their complications involving the mucous membrane may be influenced best by the administration of bacterins. A positive contraindication is the presence of a generalized gonococcus infection.

Antimeningitic Serum (Flexner).

Antidiplococcus Serum.—See CEREBROSPINAL MENINGITIS.

Antipneumococcus Serum.

Experiments with the serum of various animals immunized against the pneumococcus date back to 1891. One of the earliest was that prepared by Pane from the blood of asses, which was extensively used by Italian investigators and reported to have given good results. The sera now on the market are obtained from various animals, horses, sheep and cattle, by immunization with a number of different strains of pneumococci taken directly from individuals in various stages of pneumonia and presenting different degrees of severity of the infection. The serum is therefore *polyvalent* and some preparations are also *composite, i. e.*, contain a certain percentage of diphtheria antitoxin, which is added by some manufactures in the belief that it enhances the bactericidal power of a serum by stimulating phagocytosis.

Dosage and Administration.—The dose of American preparations is given as 10 to 20 c.c., administered subcutaneously; on the other hand, very much larger quantities—from 200 to 400 c.c.—are recommended by some German investigators working with the Merck product.

The serum produces a marked hyperleukocytosis, reduces the temperature, and has a direct influence on the blood-pressure, acting as a cardiac as well as a general tonic. It appears to be harmless. The special indications for its use are severe infection with pneumococci circulating in the blood, cases with weakening circulation, excessively low blood-pressure and pulmonary edema, and the presence of ulcus corneæ serpens. In the last named complication encouraging results are reported.

Antidysenteric Serum.

Animal sera have been prepared by inoculations of both living bacilli (Shiga) and their soluble toxins. Reports as to the value of these preparations are conflicting and they do not appear to have influenced the mortality of the disease in a very marked degree, while no influence on the morbidity is observed after the prophylactic use of antidysenteric serum. The *dose* is from 10 to 40 c.c., injected subcutaneously. Pulverized cultures of killed dysentery bacilli have also been used in the same way. The remedy is advised both in true epidemic dysentry and in summer diarrhea of children.

Antityphoid Serum.

The serum is obtained from horses injected with killed cultures of typhoid bacilli. As the technical difficulties to be overcome in the preparation of typhoid serum are considerable, the remedy has been very little used and practically the only information available in regard to its efficiency is derived from Chantemesse, who treated a number of cases with a serum prepared after his own method with bacilli grown under anaerobic conditions upon a filtrate of an emulsion of splenic tissue digested with pepsin. The dose of Chantemesse serum is from 10 to 12 c.c. for adults. Interest in this serum has languished since the introduction of vaccine therapy.

Antiplague Serum.

Of the two preparations available, that prepared at the Pasteur Institute in Paris after the method of Yersin by immunizing horses with cultures of live, virulent bacilli, and the serum of Lustig and Galeotti, who employed nucleoproteins extracted from the bacilli, only the former is now used. The curative value of this serum is very small, as the mortality among patients treated with the serum is but little lower than that observed among the control cases. As a prophylactic, on the other hand, the serum seems to be effective, but the immunity conferred is very brief, at most ten days in duration.

Dosage and Administration.—The enormous quantity which appears to be necessary to produce any impression constitutes a serious practical objection to the use of the serum. With the Yersin serum the initial dose should be not less than 100 c.c., and this dose is to be repeated two or even three times at intervals of eight hours. During succeeding days a daily injection of from 20 to 50 c.c. is given, so that a single patient may receive as much as 590 c.c. The serum in order to be of any value must be administered before the third day of the disease, by the intravenous route.

Hay Fever Serum. Pollantin.

Under the name of "Pollantin" a serum obtained from animals immunized against the pollen of various plants and grasses, especially Indian corn, has been patented in Germany, Great Britain, the United States and other countries. The serum is prepared after the method of Dunbar, who isolated a toxalbumin from the pollen of a variety of grasses, especially wheat, rye, barley, Indian corn, golden rod and ragweed, and was able, by injecting a solution of this substance subcutaneously, to produce typical symptoms of hay fever in predisposed individuals. In the United States the early summer catarrh is caused chiefly by the pollen of rye and Indian corn; while the golden rod (*Solidago virgaurea*) and ragweed (*Ambrosia artemisiæfolia*) are held responsible for the autumnal variety so prevalent in this country. Dunbar believes that the pollen toxin is identical in the various plants, and utilized for the preparation of his serum the pollen of Indian corn.

Pollantin is marketed in liquid form and as a powder, and is intended for external use only, not for subcutaneous injection. Liquid pollantin contains 1/4 percent phenol, which, however, is not sufficient to inhibit bacterial growth, if the preparation is contaminated by contact with the nasal mucous membrane or the eye.

Dosage and Administration.—In the manufacturers' directions for using *powdered pollantin* the patient is instructed to fill about one-fourth of the scoop inserted into the glass tube, hold the scoop under one nostril, and sniff the powder while keeping the other nostril closed. The same dose is then applied to the other nostril. The powder may also be used in treating the eyes, a few grains being introduced into the conjunctival sac with a camel's hair brush. The dose of *liquid pollantin* is one drop in each eye, and four or five drops in each nostril. It is stated that the substance is entirely harmless even in large doses. Pollantin should be used every morning and as often during the day as the symptoms seem to demand.

Normal Human Serum.

The use of human blood serum is of quite recent development, and may be regarded as a simplification of direct transfusion, a very old therapeutic procedure recently revived and reintroduced into practice through the work of Crile and others. The many brilliant successes achieved by direct transfusion of whole blood from one human being to another sufficiently attest the merits of the procedure; but, without entering into a discussion which would be out of place here, it must be pointed out that in not a few instances sudden death instead of the hoped for cure of the patient has resulted under circumstances which precluded the possibility of an ordinary surgical accident such as air embolism. Examination of such a patient's blood reveals hemolysis like that observed after the injection of a foreign serum in animal experiments, and the experience suggests that under certain conditions, as yet not understood, the transfusion of whole blood from one individual to another is an unsafe procedure.

The injection of animal serum into human beings produces certain undesirable symptoms which may be briefly enumerated as: fever, urticaria both local and general, erythema and scarlatiniform eruptions, cutaneous edema, pain and swelling of joints and, in rare cases, hemorrhage into hollow organs, edema of the glottis or even sudden death. (See Serum Intoxication and Anaphylaxis.) On the other hand, it is positively stated that the administration of human serum, whether in single or repeated doses, never produces serum disease or anaphylaxis in the human subject. The mode of action in the conditions in which human serum has been tried, which come under the two heads of hemophilia and bacterial infection, is still obscure; although it has been repeatedly demonstrated that normal blood serum possesses bactericidal properties. The results reported in the literature encourage a further trial of the procedure. These relate chiefly to *hemophilia neonatorum* or *infection of the new-born*, the identity of these two conditions being probable although not definitely established, *puerperal infection* and other bacteremias.

Dosage and Administration.—For infants the dose recommended is 10 c.c., injected subcutaneously, three times on the first day, and thereafter once a day as long as the symptoms appear to render it necessary. Four to five days usually suffice to effect a cure in cases of hemophilia neonatorum.

The technic is thus described by Welch. "The apparatus consists of a flask with a rubber stopper through which are two perforations. Through one perforation is fitted a U-shaped glass tube, to the outer end of which is attached, by means of a piece of rubber tubing, a short aspirating needle having a No. 19 caliber. The needle is cotton-plugged into a small test-tube, in which it is sterilized. Through the other perforation is inserted a fusiform glass tube containing cotton to prevent contaminating the contents of the flask. A small suction tube is placed on this latter for drawing the blood into the flask. The needle is inserted into a vein at the elbow and the desired amount of blood withdrawn. The blood is allowed to coagulate in a slanting position in the flask, and the serum is withdrawn as rapidly as it separates, and is then ready for use."

Convalescent Sera.

The use of convalescent sera in the treatment of acute infectious fevers is open to the theoretical objection that the subject from whom the serum is obtained has never, as in the case of animal immunisation, gone through a course of artificial stimulation of his immunizing powers by the injection of gradually increasing doses of the bacterial toxin or bacterial cultures. In addition, the practical difficulty of obtaining such a serum in any considerable quantity will always prove a bar to its extended use. The serum is withdrawn from the convalescent soon after defervescence is definitely established, and injected subcutaneously in 10 c.c. doses. The method has been tried in pneumonia, measles, scarlet fever, diphtheria, typhoid fever and, quite recently, in pellagra. The number of patients treated after this method is as yet too small to permit the drawing of any conclusion with regard to its value.

In addition to the therapeutic sera that have been discussed more or less fully in this article, there are a large number that have some claim on the attention of the student of bacteriology, but have hardly attained the practical importance which would justify their systematic treatment in an encyclopedic article. Among these may be briefly mentioned: *antituberclе serum*, which never passed beyond the experimental stage and has been superseded by tuberculin; various products obtained by inoculating animals with thyroid gland substance, of which the serum of Beebe and Rogers deserves special mention. The most recent studies with this serum have failed to realize the expectations awakened by the early reports of its successful employment in exophthalmic goiter. The many attempts to discover a therapeutic serum for the cure of cancer have ended uniformly in failure, although the quest still continues. Sera have also been prepared for the cure of leprosy, yellow fever, and some experimental work has also been done in serum therapeusis of leukemia and other forms of blood dyscrasia.

See Vaccine Therapy.

SEWAGE DISPOSAL.—Sewage consists of human excreta, solid and liquid, together with house, factory and street waters and impurities. The mixture of feces and urine undergoes rapid putrefaction, resulting in gas formation (marsh-gas, ammonium sulphid, sulphuretted hydrogen, etc.). The urea of the urine is rapidly transformed into ammonium carbonate and then into ammonia. The bacteria present are chiefly the spirillum rugula, spirillum amyliferum; bacillus butyricus, bacillus putrificus coli, bacillus proteus sulphureus, bacillus proteus vulgaris, bacillus sulphureus, bacillus lactis aërogenes; and the micrococcus ureæ. Pathogenic microorganisms, such as the bacillus typhosus, choleræ, dysenteriæ (Shiga) and streptococci and staphylococci, may be present.

No crude sewage should be discharged into a stream or river. Though in time such sewage would be purified if largely diluted, the water would be rendered unfit for drinking purposes. In towns on the sea coast sewage may be discharged directly into the sea, provided precautions are taken to prevent its being cast up by the tide or carried by currents along the coast. To obviate such dangers the outfall should be so placed that the currents may carry the sewage away from the town, the mouth of the outfall sewer being guarded by a valve and opening below the level of the water. In low-lying towns where any fall for sewage is impossible, one of the pneumatic methods of removing sewage is advisable. The Shone system acts by means of compressed air sent out from a central station. The sewage is received into ejectors into which, when full, the compressed air is admitted by a valve and forces out the sewage. In the Liernur and Berlier systems the motive power is suction; a vacuum is produced at the central station and the sewage is sucked through an air-tight system of sewers to the central reservoir.

Methods of Application to Land.

(1) **Broad Irrigation.**—This consists in the distribution of sewage over a large area of soil and is applicable to towns which can procure land of adequate size (one acre to every 100 to 200 people) and of suitable quality. Percolation of the sewage through the soil is provided for and stagnation is prevented by subsoil drains, unless the land is very porous. The sewage must be applied intermittently so as not to interfere with aeration of the soil. Large crops of Italian rye grass, roots (mangold) and cabbage may be obtained from a sewage farm.

(2) **Filtration.**—The increasing cost of land has led to the use of an equally effective but cheaper method—that of intermittent downward filtration on a small surface of especially porous land called a bacterial bed. The best soil is one rich in lime or alumina or hydrated iron oxid. The land is underdrained with porous tile drains and divided into sections, each of which receives screened sewage for 6 hours and rests the other 18 hours of each day. The process is that of oxidation and nitrification by microorganisms through the mechanical filter of the soil. This method is applicable to the sewage of considerably less than 1000 persons per acre. Usually the land is divided into ridges, upon which vegetables are grown, and furrows, down which the sewage flows.

If there is not sufficient land available to provide one acre for the sewage of each 1000 persons, preliminary treatment is necessary before the disposal on land:

Sedimentation and Chemical Precipitation.—The sewage is treated with lime (about 12 grains to the gallon of sewage), or protosulphate of iron (2 to 5 grains per gallon), or sulphate of aluminum (about 5 grains per gallon) in settling tanks, having preferably a conical bottom, in order to remove suspended matters. The supernatant liquid is then applied to the land, or passed intermittently through special filters of sand, coke, coke-breeze, etc., or discharged into a large river or the sea. The sludge is generally partly rid of moisture by hydraulic filter presses and drying machines and used as manure. By this treatment the sewage of 2000 to 5000 persons can be disposed of on one acre of land. In London before the sewage is discharged into the sea it is treated with lime and sulphate of iron. Combinations of iron and alum, or alum and lime are also in use.

Biologic Purification.—Depending on the principle that the decomposition and purification of sewage, which is chiefly organic matter, is essentially due to the action of microorganisms, newer methods than chemical treatment and land application have been adopted. These have the advantages of greater efficiency and marked reduction in the amount of sludge and in the expense and labor involved.

In the changes occurring in sewage there are mainly two stages. The first is a process of digestion in which the anaerobes (microorganisms living without oxygen) play the chief rôle—the solid organic matter becomes liquefied, nonnitrogenous matter is reduced, albuminoid substances are peptonized; the second stage is one of oxidation, mineralization and nitrification, the ultimate result being mineral matters and gases—in this stage the work is done largely by the aerobes (oxygen-requiring microorganisms). The various types of installation in use at present are based upon the principle of separating these stages, with a view to placing the two main groups of microorganisms in the most favorable conditions for work. The first stage is allowed to take place in a digestive tank under strictly anaerobic conditions, while the second stage is effected during the passage through one or more aerating contact or filter-beds. Aerating filter-beds known as "streaming filters" are preferably constructed of coke, clinkers, flint, burnt ballast, coal, refuse pottery, and, less effectively, of sand or gravel. They have open outlets and afford the best means of securing efficient oxygenation of the effluent.

Before entering the installation the sewage must always be passed through a "grit chamber" to be freed from all large mineral particles. When the crude sewage is highly offensive as a result of wastes from breweries, preliminary treatment in slate beds is advisable.

The Scott-Moncrieff installation includes two or more "cultivation tanks" filled with large stones at the bottom and small above. The sewage passes to a false bottom on the floor of the tanks and escapes at the top. The effluent flows into a series of nitrification channels filled with large stones and exposed to the air. A modification of this system has a series of perforated trays containing filtering media over which the effluent slowly falls.

The Sutton System advocated by Mr. Dibdin consists of straining, then downward filtration through coarse beds of burnt ballast 4 feet deep. The effluent passes into five filters 4 feet deep where it rests for 2 hours. These contact beds are emptied slowly and then allowed to rest several hours. By this intermittent application aeration is provided for. In a modification of this system the sewage rests 4 hours in the coarse beds and 2 hours in the fine beds (treatment in a series of which is more effective to that in merely one).

The Septic Tank Method.—The sewage enters a covered tank where it remains for a day under anaerobic conditions (rest and absence of air and light) and becomes liquefied. The effluent passes through the outlet and along a trough or aerator over the edge of which it falls in a thin film, combining with air to a certain degree, upon a series of coke-breeze filter-beds 4 1/2 feet deep. Each filter is filled in 6 hours, then after 6 hours of rest it is emptied in a half hour and then left empty for aeration the remainder of the 24 hours. Small septic tank disposal plants have been installed effectively for the sewage of large houses.

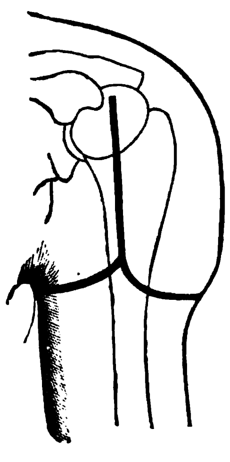
Antiseptic Methods.—A purified effluent should be inodorous and not liable to undergo putrefaction. It is always potentially dangerous, however, for pathogenic organisms may still be present. Therefore prior to being thrown into a running stream, it is generally passed from the installation through a special sand filter or applied to land. Even then if discharged into waters where watercress is grown or oysters or other shell fish are laid, there is danger of contamination. The question of sterilization of the effluent has given rise to considerable study. Antiseptics and deodorants are advised and may be used to advantage if they do not interfere with the work of the microorganisms. In the A B C process alum, blood, clay and charcoal are used. Manganate of sodium and sulphuric acid are advocated. The Amines process consists of the addition of milk of lime and herring brine. Chlorin, either as chlorid of lime or gas, seems to be the most practical antiseptic. In the oxychlorid method, sea water or salt solution is decomposed electrically. In one hour 3 1/4 gallons are said to partially sterilize 1000 gallons of effluent from a biologic instillation. This treatment is claimed to render sewage effluent practically free from intestinal organisms.

SHINGLES.—See Herpes Zoster.

SHOCK.—The depression or grave effect produced by severe injuries, operations, or strong emotions. A relaxation or abolition of the sustaining and controlling influence that the nervous system exercises over the vital organic functions of the body. It is the result of a profound impression made on the cerebrospinal axis, either directly, through the agency of an afferent nerve, or through the circulatory medium. Deferred shock is that curious condition in which the manifestations of shock, due not to severe bodily injury, but to purely mental causes, develop after the lapse of some time from the occurrence. This variety of shock may be even more profound than that produced by bodily injury.

Treatment.—The body is to be reclined, with the feet higher than the head, unless cyanosis is thus developed. Hot bottles and blankets are to be used, particularly over the extremities, and hypodermic injections of ether, brandy, strychnin, atropin, or digitalis given. Inhalations of amyl nitrite may be used. Strychnin, in doses of 1/30 of a grain, may be given every 10 to 15 minutes for 3 doses. Atropin, or atropin with strychnin, is indicated when the skin is moist. A turpentine enema is sometimes available, while hot coffee and other hot fluids can be given by the mouth and rectum. The rectum may be able to do what the stomach will not, and enemata of normal salt solution are to be considered. In extremely critical cases, particularly when anemia ensues from loss of blood, intravenous saline infusions may be lifesaving. See Infusion of Saline Solutions.

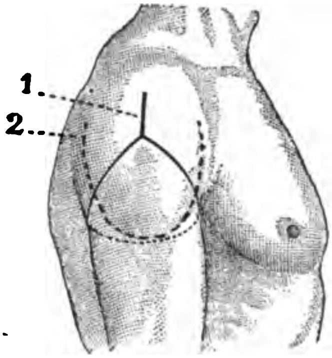
Dawbarn considers five points to be especially observed in the treatment of shock by "the free use of intravenous, hot, saline infusion": (1) The place of entrance, which in most cases is the median basilic vein, occasionally a vein in the operating wound, while, when speed is not a factor, the rectal route is an excellent one. (2) As to the solution, it should be the so-called normal, really decinormal, salt solution, which is 6 parts of common table salt to the thousand, boiled and filtered; roughly, a heaped teaspoonful to the quart. (3) The solution should be as hot as can be borne by the hand—about 120° F. (4) In the adult the amount should never be less than a liter, often 2, and occasionally 3, always injecting slowly. (5) The time occupied introducing the fluid into a vein should never be less than 10 minutes to the liter. In severe cases bandaging the extremities in order to send the blood to the brain and vital centers is advocated. Operation under shock, save under imperative necessity to save life, is contraindicated. Even amputation under shock is inadvisable. Suppression of urine is an after result of shock to be closely watched. Diuretics are to be given after recovery. Deferred shock is to be treated in essentially the same manner as primary shock, but more care is to be given to distinguish hemorrhage. Of course, if hemorrhage is present, it must first be checked. When shock is the result of sepsis, the treatment is that of sepsis (*q. v.*) In nervous delirium morphin and its congeners, and other sedatives, are to be employed. See Collapse.



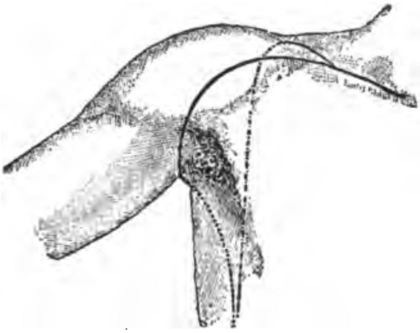
Spence's Amputation.—(*Moullin.*)

SHOULDER, AMPUTATION. The Flap Method.—The patient is placed on a firm table, with the arm well raised and projecting beyond its edge; the subclavian artery being compressed, the operator enters a long, narrow, straight bistoury at the anterior margin of the deltoid muscle, if it is the right arm, an inch below the acromion. From this point he thrusts it through the muscle, across the outside of the joint, and brings it out at the posterior margin of the axilla. If the left arm is operated on, the knife must be entered at the posterior margin of the axilla and brought out at the anterior margin of the deltoid. Then, by cutting downward and outward the external flap is made. The arm is then brought down to the side and forcibly adducted; the origins of the biceps and triceps and the insertions of the infraspinatus and supraspinatus are cut through and the joint laid open. Finally, the blade of the knife, being passed through the joint and placed on the inner side of the head of the bone, is made to cut an inner flap of the same shape, but rather shorter than the outer one.

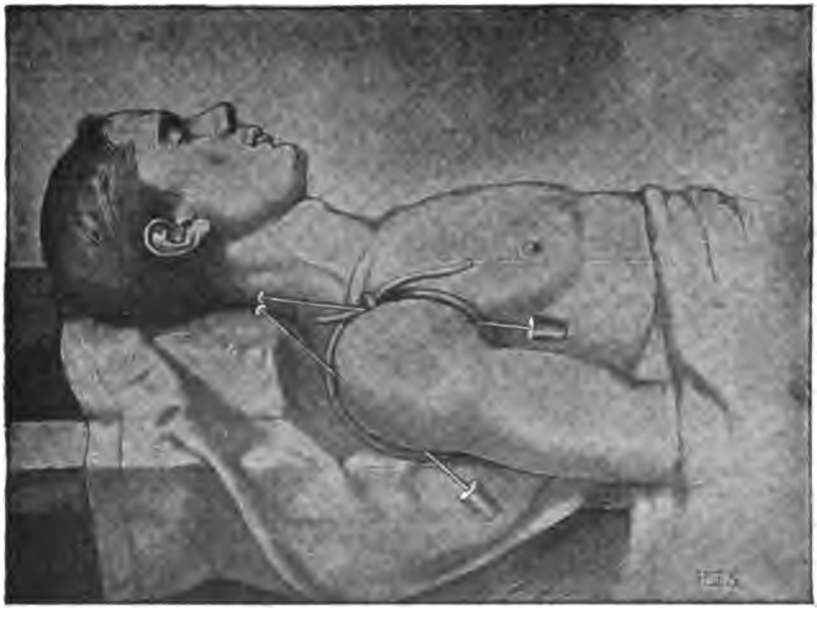
Oval Method.—In order to control hemorrhage, pins similar to those already described for amputation of the HIP-JOINT (*q. v.*) are now employed: one to be passed through the pectoralis major muscle and brought out in front of the acromion process; the other passed through the latissimus dorsi muscle and brought out back of the acromion. The points are to be protected by cork. The rubber band is to be put on above the line of operation, and is to be removed as soon as the limb is amputated and the vessels secured. Make a straight incision immediately beneath the acromion process, and a little toward the anterior border of the axilla, with a moderate-sized amputating knife, which should reach down to the bone, and should be between 2 1/2 and 3 inches in length; from the lower end of this incision two others are prolonged, the first passing in a curved direction downward and backward, and the second forward toward the folds of the axilla, the blood-vessels and the inner or axillary aspect of the arm remaining untouched. The flaps are then dissected back, including the muscles and exposing the joint. The head of the bone is then disarticulated by cutting upon the tuberosities, the arm being rotated inward and outward. The arm is then adducted, throwing the head of the humerus outward, and the knife is passed to the inner side and carried downward close to the bone, an assistant at the same time compressing the artery. Then the tissues between the axillary folds are divided by an oblique cut from within outward so as to form part of the internal incision.



1. LARREY'S AMPUTATION. 2. DUPUYTREN'S AMPUTATION. —(*Esmarch and Kowalzig.*)



INTERSCAPULO-THORACIC AMPUTATION.—(*Esmarch and Kowalzig.*)



SHOULDER-JOINT AMPUTATION. Pins and rubber-tube tourniquet in position.—(*Wyeth.*)

The axillary artery and branches of the anterior and posterior circumflex and of the suprascapular arteries are to be tied.

SHOULDER, DISLOCATION.—Shoulder-joint dislocations are quite frequent, and are usually readily diagnosed, but sometimes evade recognition.

Forward luxation of the humerus is the most frequent of the shoulder dislocations, and, according to the degree of displacement, is described as **preglenoid, subcoracoid,** and **subclavian;** the degree termed subcoracoid is most common. Sometimes the dislocation is somewhat forward and downward (infraglenoid) primarily, and becomes subcoracoid by a secondary displacement.

Forward displacement may result from direct violence, as a sharp blow on the shoulder from the side and behind; but generally results from indirect violence, as pushing the elevated arm powerfully backward. Occasionally, muscular action (hurling a stone) may produce it.

The symptoms of subcoracoid dislocation are characteristic: the head of the bone is absent from the glenoid fossa and presents beneath the coracoid process; the rounded outline of the shoulder has disappeared, the acromion hanging over and forming an angular projection; the long axis of the arm passes under the coracoid process instead of beneath the acromion; as a result, the arm is held abducted; the elbow can be pressed against the body, but on being released springs back immediately to its abducted position (elastic fixation). The outer contour of the arm is no longer almost straight, but forms an angle opening outward, with its apex at the humeral insertion of the deltoid. Voluntary movements are much restricted and passive movements are limited and painful.

Injuries to the blood-vessels are rare; the nerves are put on the stretch, and are sometimes injured, especially the circumflex nerve, resulting in serious injury to, and sometimes atrophy of, the deltoid muscle.

In making the **diagnosis** the following conditions must be differentiated:

Paralysis of the deltoid, with descent of the arm; fracture of the acromion; upward dislocation of the acromial end of the clavicle; fracture of the neck of the scapula; and fracture of the neck of the humerus.

Treatment.—Kocher's method is always to be attempted: first, without an anesthetic; and, if unsuccessful, then with an anesthetic. It is uniformly successful except in cases of very extensive laceration of the capsule. This procedure is as follows: The elbow, fixed at a right angle, is pressed closely against the side; the forearm is next turned as far as possible away from the trunk, causing external rotation of the bone-head; the elbow is next carried across the chest, forward and upward, the external rotation of the bone-head being meanwhile maintained; and, finally, the hand is placed on the opposite shoulder, producing inward rotation. It may be useful to have an assistant press the head outward with the fingers during the latter manipulation. The classic method of Sir Astley Cooper is also of service in some cases(traction upon the arm in the longitudinal direction, with simultanous pressure of the foot—unshod—in the axilla, making direct pressure on the head).

After reduction, the arm should be fixed by slings or bandages (Velpeau's) so that the head of the injured side rests on the opposite shoulder.

Upward (supracoracoid) dislocation is extremely rare, and is always associated with fracture of the coracoid process.

Downward (subglenoid or axillary) dislocation is usually the result of a fall upon the hand or elbow with the arm raised. The appearance is characteristic: the bone-head can be felt in the axilla, and when the arm is raised at right angles, the change in axial line, together with the empty socket and the overhanging and prominent acromion, make the condition evident.

A subvariety of this injury is the *luxatio erecta,* in which the arm is directed upward, with the forearm held behind the head to avoid pain. Reduction is easily effected by traction on the arm, together with direct outward pressure against the bone-head.

The following useful table (Pick) will aid in diagnosing the various forms of dislocation of the shoulder:

	DIRECTION OF THE AXIS OF THE LIMB.	ALTERATION IN THE LENGTH OF THE LIMB.	PRESENCE OF THE HEAD OF THE BONE IN NEW SITUATION.
Subcoracoid.	The elbow is carried backward and slightly away from the side.	Very slight lengthening.	The head of the bone cannot easily be felt; if it can, it is found at the upper and inner part of the axilla.
Subglenoid...	The elbow is carried away from the trunk and slightly backward.	Very considerable lengthening.	The head of the bone can easily be felt in the axilla.
Subspinous..	The elbow is raised from the side and carried forward.	Lengthening intermediate in degree between the subglenoid and the subcoracoid.	The head of the bone can be felt and be grasped beneath the spine of the scapula.
Subclavicular.	The elbow is carried outward and backward.	Shortening....	The head of the bone can readily be seen and be felt beneath the clavicle.

Backward (retroglenoid, subacromial, subspinous) dislocation is very rare, and is usually the result of direct force. The prominence of the bone-head in its new position and the projection of the coracoid process make the diagnosis easy. Traction, together with adduction and direct pressure, effects reduction.

Irreducible Dislocations.—When dislocation is accompanied by fracture of the humeral shaft or fracture below the anatomic neck—as by the separation of the tuberosities, or by a dislocation of the long head of the biceps, with its twining about the humeral neck—primary reduction may be accompanied by insurmountable difficulties. Under these circumstances there can hardly be a question about the propriety of immediate operation. The very brilliant result obtained by McBurney and others by the use of a bone hook inserted into the upper fragment through an open incision, thereby making reduction of the dislocated head feasible, will in the future justify like procedures in all similar cases. In unreduced dislocations of older date the question of operative interference must be entirely determined by the degree of disability entailed. When this is slight, and the patient is able to gain a livelihood, and when pressure-symptoms produced by the dislocated head are absent, the advisability of operative interference must be questioned, particularly if the dislocation is one of more than two or three months standing. Positive indications for operative interference are pressure upon the vascular or nerve-trunks with which the head of the humerus has formed new relations.

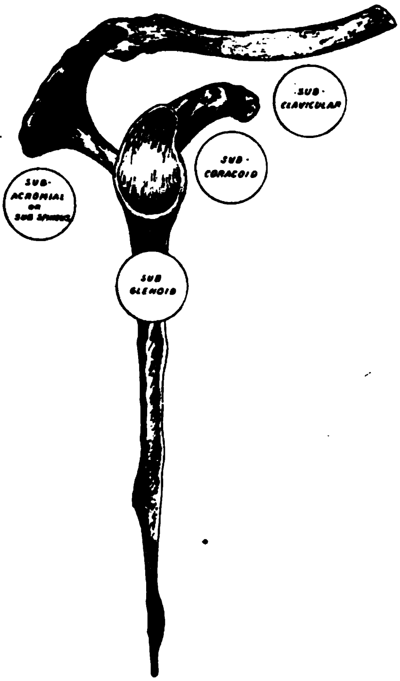


Diagram of most common Varieties of Dislocation of the Shoulder.—(*Thomson and Miles' Manual of Surgery.*)

The present status of the question of operative interference in shoulder luxations may be summarized as follows (Ransohoff):

1. Immediate operative interference is indicated when the ordinary methods by manipulation under anesthesia have failed.
2. In irreducible dislocations operations should not be delayed until irremediable changes have taken place in the capsule and about the humeral head. In comparatively recent cases arthrotomy offers the best results.
3. In long standing cases the conditions found must determine the choice between arthrotomy and resection.
4. In unrecognized dislocations of long standing—one year or over—only grave compression symptoms must be recognized as indications for interference.
5. Special attention must be given to the prevention of sepsis, since, in a very large proportion of cases recorded, sepsis has been either the cause of death, or, by the destruction of the humeral head or obliteration of the joint cavity, has frustrated the very object of the operation.

SHOULDER, EXCISION.—This may be required for injury or disease. Ankylosis is compensated for so thoroughly by the mobility of the scapula that it is a question whether operation is advisable. It has also been performed for unreduced dislocation in which the head of the bone was resting upon the bracial plexus, and for tumors in connection with the upper extremity of the humerus.

The usual incision is vertical, between 3 and 4 inches in length, beginning just outside the coracoid process, on a level with it, and carried through the skin, fascia, and deltoid, down to the bone. If the arm is rotated outward and the soft part drawn to the sides, the tendon of the biceps is exposed at the bottom. This should be preserved, if possible; sometimes it is in a pulpy condition, or has already been eroded, and occasionally it is fixed firmly to the bone in its groove, and the upper end of it is lost. The capsule is then freely opened and the condition of the parts examined before determining how much it is necessary to take away.

So far as the subsequent utility of the limb is concerned, there is no doubt that the more of the bone that is left, the better. Partial resections (in which some of the head is left, the rest being gouged away) give better results than when the anatomic neck is divided; and this is to be preferred to the surgical neck. The entire diseased process must be removed (in cases of tumors springing from the head of the bone, one-third, and in some cases even more, of the shaft has been excised, preserving the elbow and the hand); but consistently with this, as little as possible of the healthy bone. The question of subperiosteal excision is still open, but there is ground for believing that when it is practicable, the results are superior to the other method. If the surgical neck requires division, the arm must be strongly rotated outward by the assistant as soon as the capsule is opened, in order that the tendon of the subscapularis may be cut; and then inward for the short external rotators. As soon as this is done the head of the bone rises well up into the wound, and may be either sawed off with a narrow-bladed saw *in situ*, the soft parts being protected and held aside by retractors, or thrust bodily out. The glenoid fossa very rarely requires more than the application of a gouge.

A counteropening at the back of the joint is usually advisable for drainage. The wound is thoroughly cleansed; the margins drawn together with sutures; a large tube placed across it; and the cavity of the axilla, the space behind the shoulder, and the outer side and front of the arm thoroughly packed with wood-wool. Stromeyer's elbow cushion should be used as long as the patient is in bed, and passive motion commenced as soon as the condition of the wound allows it, the fingers and wrist being exercised from the first (Moullin).

SIALAGOGS (**Ptyalagogs**).—Agents which increase the secretion and flow of saliva and buccal mucus, either by reflex action from local irritation produced when anything is taken into the mouth, or by stimulating the glands during their elimination. The principal sialagogs are divided into two groups: (1) *topical sialagogs* acting by reflex stimulation; the chief of which are: Acids and alkalies, ether, chloroform, mustard, ginger, pyrethrum, mezereon, tobacco, cubebs, capsicum, rhubarb, horse-radish, (2) *general sialagogs*, acting through their systemic influence on the glands or their secretory nerves; the chief of which are: Pilocarpus (jaborandi), muscarin, physostigma, mercurials, iodin compounds, antimonials, tobacco, ipecacuanha.

Agents which diminish salivary secretion are called ANTISIALAGOGS (*q. v.*).

SIDEROSIS.—Pigmentation of the lung tissue due to inhalation of metallic particles.

SIDONAL.—Quinate of piperazin. It is used in uricacidemia, gout, rheumatism in doses of 5 to 20 grains in the form of powder or solution, 75 grains being given in 24 hours.

SIGHT.—See VISION.

SILK AND SILKWORM-GUT.—See LIGATURE.

SILVER (**Argentum**).—Ag = 108; quantivalence 1. A malleable and ductile metal of brilliant white luster. It tarnishes only in the presence of free sulphur, sulphur gases, and phosphorus. It is an excellent substance for vessels used in pharmacy and for sutures used in surgery.

Therapeutics.—Internally, the silver salts are used in dyspepsia with vomiting of yeasty fluid; chronic gastritis and gastric ulcer; dysentery of chronic type, especially if rectal ulcer (the nitrate internally and by enema); the diarrhea of phthisis and typhoid fever (nitrate with opium); chronic spinal inflammations causing locomotor ataxia or paraplegia; and epilepsy (in the latter affection the nitrate has occasionally given good results).

The **oxid** has been used internally for gastric neuralgia, irritative dyspepsia, pyrosis, gastric and pulmonary hemorrhages, and menorrhagia.

Used locally, the **nitrate** of silver is caustic, excitant, astrigent, and hemostatic. Strengths of nitrate of silver sufficient to prove astringent are also apt to be irritative. Thus, when used on mucous surfaces, the agent is liable to excite the mucous glands, if not to increase the inflammation. Under other conditions the irritating quality of the drug acts to advantage, and it is often selected when an excitant, and at the same time astringent, effect is desired. Nitrate of silver is a weak caustic on the most delicate tissues, but is a futile one on tough, resistant tissues. It is an astringent and hemostatic through the direct constricting effect it exerts on the caliber of the smaller vessels, and in the pressure exerted on them by the hygroscopic albuminate created by the salt.

In gastric catarrh:

℞.	Silver nitrate,	gr. v
	Extract of hyoscyamus,	gr. x.

Mix and make into 20 pills. Take one 3 times daily, a half-hour before meals.

In typhoid fever:

℞.	Silver nitrate,	gr. vj
	Extract of opium,	each, gr. ij.
	Extract of belladonna,	

Divide into 24 pills. One pill 3 times daily after taking food.

Poisoning.—Given internally in small doses, silver salts increase secretion, stimulate the heart, promote nutrition, and act as a nerve tonic. Their continued use produces symptoms which are collectively termed *argyria*, and are as follows: Gastrointestinal catarrh; tissue waste; uremia; albuminuria; fatty degeneration of the heart, liver, and kidneys; hemorrhages; fluidity of the blood; a slate-colored line along the margin of the gums and a similar discoloration of the skin and mucous membranes, with centric impairment of the nervous system, producing extensive paralysis, loss of coordinative power, convulsions, and, finally, death by paralysis of respiration. Large doses produce violent gastroenteritis; also ulcer of the stomach from thrombosis of its veins and destruction of the gastrointestinal mucous membrane.

Common salt freely used is the antidote, precipitating the silver as the insoluble chlorid and acting as an emetic. The nitrate is exceedingly sensitive to organic material and light, which decompose it readily. Incompatibles are all the soluble chlorids (hence it should be used in distilled water), most of the mineral acids and their salts, alkalies and their carbonates, lime-water, and astringent infusions. A course of silver medication should be regulated by suspending the remedy after 5 or 6 weeks' use, and then promoting elimination by purgatives, diuretics, and baths. To prevent the general discoloration, potassium iodid should be given conjointly with the silver, and baths of sodium thiosulphate should be used frequently.

Preparations.—There are three official salts, the nitrate, cyanid, and oxid.

Argenti Nitras, $AgNO_3$, occurs in colorless rhombic crystals, of bitter caustic taste and neutral reaction, soluble in 0.6 of water and in 26 of alcohol. Is best given in pill **with kaolin,** or in distilled water; never with **tannin** or a vegetable extract, lest an explosive compound result. Dose, 1/6 to 1/2 grain; if watched, up to 1 **grain** may be given. When melted with 4 percent of hydrochloric acid, it makes: **A. Nitras Fusus,** *Lunar Caustic,* for local use as a mild caustic and astringent. **A. Nitras Mitigatus** is the same salt melted with twice its weight of potassium nitrate. It is used locally by ophthalmologists. **A. Cyanidum,** AgCN, has no medicinal use except for the extemporaneous preparation of hydrocyanic acid. **A. Oxidum,** Ag_2O, a brownish-black powder, nearly insoluble in water and insoluble in alcohol. It is liable to decompose with violence when mixed or triturated with readily oxidizable or combustible substances as creosote, phenol, potassium permanganate and many others. It should not be brought into contact with ammonia. Dose, 1/2 to 2 grains in pill with kaolin. It is not a dangerous internal remedy. **A. Citras,** called also antiseptic Credé. See ITROL. **A. Lactas,** see ACTOL. See also ARGONIN; ARGYROL.

SINAPIS.—See MUSTARD.

SINAPISM.—See POULTICE.

SINGULTUS.—See HICCUP.

SINUSES, ACCESSORY, DISEASES.—See NOSE (Accessory Sinuses).

SIX HUNDRED AND SIX.—See SYPHILIS.

SKIAGRAPHY.—See ROENTGEN RAYS.

SKIASCOPY.—See RETINOSCOPY.

SKIN-DISEASES, DIAGNOSIS.—Skill in the diagnosis of diseases of the skin requires not only a sound knowledge of the principles of medicine, but also an acquaintance with the pathology of cutaneous disorders; it is, besides, necessary to be familiar with the physiology and minute anatomy of the integument.

It should be remembered that the same pathologic conditions that are found acting elsewhere on the economy are also present in the skin; and that, therefore, this organ is equally subject to such processes as anemia and hyperemia, atrophy and hypertrophy, inflammation, new growth, and infection from animal and vegetable parasites; but it should also be recalled that while many, perhaps the majority, of these alterations are local in character, some of them are the result of general states, although not to the extent, and not even in the manner, that our humoralistic predecessors imagined.

With so much premised, it is but just to say that the difficulties of diagnosis in this branch of medicine have been considerably exaggerated—the result in part, perhaps, of undue refinement in classification and unnecessary pedantry in nomenclature. Experience has shown that many of these difficulties may be minimized, and the way made smoother, if some systematic method of examination is followed.

However, before entering into details, attention may be directed to the importance of endeavoring, first, to establish the diagnosis from the objective symptoms present in a given case. Until he has made the diagnosis as far as it is possible to make it by these visible and tangible signs of disease, the physican should keep himself as free as may be from preconceptions arising from the patient's statements or his own interpretations of past events. For example, it is seen often enough that, when the examiner presumes, rightly or wrongly, that a patient has had syphilis, his whole investigation is tinctured by that presumption. This mental attitude is all the more pronounced in those with but scant experience in dermatology. Of course, it is not always possible to draw a sharp line in these matters, and the scheme to be presented is to be regarded merely as suggestive.

Light.—In examining the skin for evidences of disease, artificial light should be avoided, and the first examination, at any rate, should be made in the daytime. Only in this way can slight differences in shades of color be detected—a matter at times of no slight importance: as, for example, in syphilis, tinea versicolor, and certain pigment anomalies.

Temperature of the Room.—If a patient is undressed in a cold apartment, upon exposure the skin will become mottled from congestion, and will take on an appearance simulating closely certain erythematous disorders, especially the early erythematous syphilid, or other like conditions. Consequently, an examination should always be conducted in a pleasantly warmed room. Having thus arranged the surroundings of the patient, attention may next be turned to the patient himself.

General Inspection.—The physician should never rest contented with the patient's statement in regard to the character and location of an eruption: as, for instance, that a certain patch on the abdomen is exactly like one on the face, etc. On the contrary, the examination should be thorough, and as much of the surface of the body inspected as possible; and even in the case of women, this may readily be effected by examining different portions of the skin successively. As a matter of course, this practice may be neglected in conditions obviously localized; but in generalized eruptions or in doubtful cases it is an absolute necessity to satisfactory diagnosis. By way of illustration, the fact may be cited that the nature of an ill-defined lesion of psoriasis on the face may be fully established by more characteristic types of the same disease if the elbows and knees are inspected. Again, the differential diagnosis between eczema and scabies may be made, both affections having certain features in common, if, upon a general survey of the body surface, the eruption in the latter disorder is found to occupy the classic sites of scabies: viz., between the fingers, at the wrists, the axillæ, the pubic region, especially the penis in the male, under the breasts in women, the buttocks, the inner sides of the thighs, and, in fact, wherever there are heat and moisture.

Extent of Surface Involved.—In making the general inspection just recommended, attention must also be paid to the amount of surface involved and to the localities occupied by the eruption. In addition to the illustration just given, it should be recalled that the exanthems usually cover the whole body; that the early syphilids are widely distributed; that acne is seated upon the face and shoulders; that psoriasis is likely to be symmetrically disposed; and that tinea versicolor is found on the trunk, xanthoma on the lids, lupus and epithelioma generally on the face, and lupus erythematosus on the nose and cheeks.

Arrangement of Lesions.—It is important to know whether the lesions occupy one or both sides of the body, and whether they possess any special arrangement. For example, in zoster the eruption is unilateral and the eruptive elements follow the course of cutaneous nerves, displaying clusters of vesicles on a red base. In ringworm the lesions affect a ringed arrangement, and extend at the periphery while clearing in the center. This disposition is also to be noted in psoriasis and in some syphilids; herpes iris is annular. Moreover, the eruption in syphilis is often grouped—a feature also to be observed in dermatitis herpetiformis; but the first-mentioned affection presents no marked subjective symptoms, whereas in the latter there are intolerable itching and burning.

Color.—The color of an eruption is often at least an auxiliary aid to diagnosis. The brownish-red or ham color of some syphilids differs from the underlying brighter red of psoriasis, and it also may be said that the thick greenish crusts of syphilis are fairly characteristic. The favus cups are sulphur-yellow; the patches of tinea versicolor are of a fawn tint; keloidal tumors are pinkish; and the new growths of xanthoma are buff-colored. In the same way the shade of color presented by an inflammation of the skin will measurably indicate its acute or chronic character.

Touch.—The affected skin should also be pinched up between the fingers, in order to get as accurate an idea as possible of the amount of infiltration present, the special tissues involved, the temperature, the presence or absence of fluctuation, etc. An account of the symptoms revealed by the educated touch will often determine whether a disease is superficial or deep-seated, and thus eliminate whole groups of disorders from the field of discussion.

Odor.—The odors arising from certain diseases of the skin are at times helps to their diagnosis. Favus has a peculiar mouse-nest smell; syphilitic ulceration emits a nauseating stench that is suggestive; while the smell of gangrene is well recognized.

Acute or Chronic.—The objective aspect of the disease is indicated by these terms rather than the time occupied in its development, the latter point receiving notice more particularly when the previous history of the case is under inquiry. For example, an eczema may have an acute appearance although a long time in existence, while a syphilid may be of recent origin yet lack all evidence of acuteness. Any changes that may have occurred, such as crusting, scarring, and the like, should be carefully noted, and the extending or outer margin of a patch should be especially observed, as often in this way we may detect the primary lesions (*e. g.*, in lupus) of an eruption that has been disguised by complications or treatment.

Individual Lesions.—It so happens that diseases of the skin, whatever may be their cause or nature, impress themselves upon the integument by certain elementary forms called primary lesions, which have been justly termed the alphabet of dermatology; and there are also to be observed certain other manifestations that are partly the sequels of the initial processes or are the effect upon them of traumatism—these are termed secondary lesions.

The primary lesions consist of macules, papules, vesicles, blebs, pustules, tubercles, wheals, and tumors.

Macules are discolored patches of skin, of variable shape and size, without elevation or depression.

Papules are circumscribed solid elevations of the skin, varying in size from that of a pinhead to that of a pea.

Vesicles are pinhead-sized to pea-sized circumscribed elevations of the epidermis, containing clear or opaque fluid.

Blebs are round or irregularly shaped pea-sized to egg-sized elevations of the epidermis, containing clear or opaque fluid.

Pustules are circumscribed, flat, or acuminate elevations of the epidermis, containing pus.

Wheals are edematous, circumscribed, irregular, pinkish elevations of the skin, transitory in character.

Tubercles are circumscribed, solid, deep-seated elevations of the skin attaining or exceeding the size of a pea.

Tumors are variously sized and shaped prominences, having their seat in the corium or subcutaneous tissue.

The secondary lesions comprise scales, crusts, excoriations, fissures, ulcers, scars, and stains.

Scales are dry epidermal exfoliations shed from the surface of the skin.

Crusts are brownish or yellowish masses of dried exudation.

Excoriations are epidermal denudations, usually the result of local traumatism.

Fissures are linear cracks or wounds in the epidermis or corium due to disease or injury.

Ulcers are round or irregular losses of tissue involving the skin and subcutaneous tissue.

Scars are connective-tissue new formations occupying the region of former losses of tissue.

Stains are discolorations of the skin left after the disappearance of cutaneous lesions.

While it is absolutely necessary for one desiring a knowledge of dermatology to know thoroughly these pathologic processes, it is not claimed that the recognition of a primary or secondary lesion will immediately give a clue to the diagnosis; for it is well known that these lesions are due to the most varied morbid states, and that the same kinds of lesions will often be found in very dissimilar diseases. If, however, the type of the lesion has been determined, at least the field of investigation has been considerably narrowed. For instance, it is of decided advantage to be aware that in herpes zoster there are vesicles and not tubercles; that in a disorder presenting macules we have not to deal with pemphigus or acne or urticaria, for these affections are characterized by an entirely different order of lesions. The same reasoning holds good, in a measure, for secondary lesions, such as crusts, ulcers, scars, scales, etc.

Macules occur in chloasma, eczema, erysipelas, roseola, rubeola, scarlatina, rötheln, erythema, ephelis, leukoderma, melanoderma, tinea versicolor, syphilis, xanthoma, purpura, nævus pigmentosus, and morphea. When a large portion or the entire skin is involved by change of color, it is known as a discoloration: such, for example, as is seen in Addison's disease, leprosy, and argyria.

Papules are observed in acne, milium, comedo, eczema, lichen, prurigo, in certain kinds of purpura and urticaria, and in variola, keratosis pilaris, ichthyosis, and miliaria papulosa. The eruptions of measles and rötheln are really maculopapular in character. In syphilis the papule is often surmounted by a scale.

Tubercles are found in connection with syphilis, leprosy, parasitic sycosis, acne, molluscum epitheliale, and lupus.

Tumors exist in carcinoma, sarcoma, syphilis, elephantiasis, angioma, keloid, lipoma, fibroma, and erythema nodosum.

Vesicles are present in eczema, herpes, vaccinia, sudamina, miliaria, varicella, dermatitis, dysidrosis, scabies; vesicopustules are observed in impetigo contagiosa, the vesicular syphilid, etc.

Blebs occur in pemphigus, hydroa, erysipelas, herpes iris, leprosy, syphilis, and dermatitis.

Pustules are encountered in acne, variola, ecthyma, equinia, impetigo, scabies, syphilis, sycosis, dermatitis, and pustula maligna.

Wheals are found in connection with irritable states of the skin, such as occur from the bites of insects, and most typically in urticaria, and also in some degree with purpura and erythema multiforme.

Scales are observed in psoriasis, eczema, pityriasis rubra, exfoliative dermatitis, scarlet fever, measles, seborrhea, the vegetable parasitic affections, and ichthyosis.

Crusts are to be found in eczema, syphilis, scabies, ecthyma, scrofuloderma, leprosy, syphilis, impetigo, carcinoma, seborrhea, herpes zoster, and sycosis.

Fissures occur in eczema, psoriasis, syphilis, ichthyosis, verruca.

Excoriations are to be seen in pruriginous disorders, such as eczema, pruritus, pediculosis, scabies, etc.

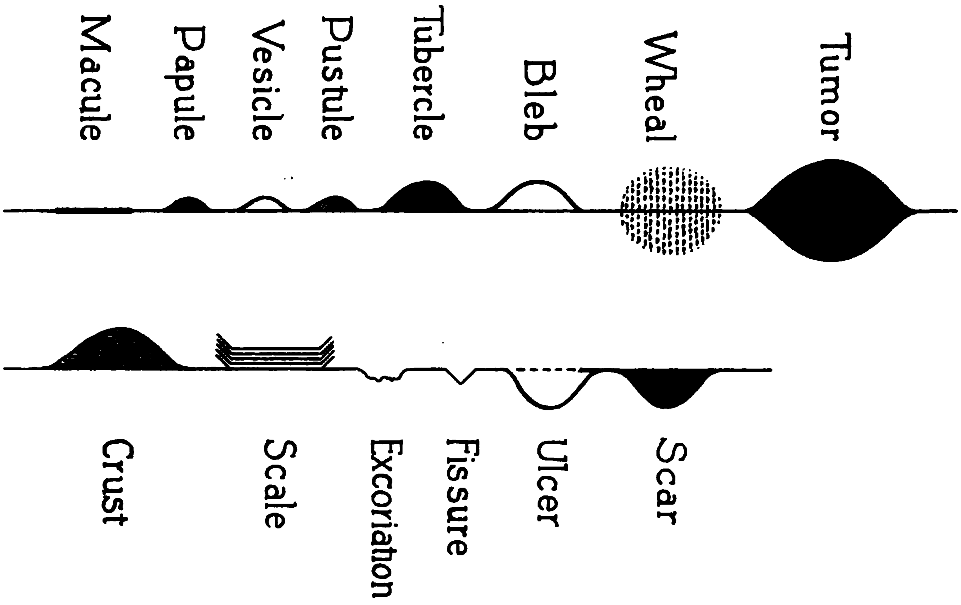


Diagram of Skin-lesions.

Ulcers appear as sequels to the lesions of syphilis, lupus, boils, carbuncles, eczema, herpes zoster, scrofuloderma, epithelioma, sarcoma.

Scars come in the wake of ulcerative skin-diseases: *e. g.*, lupus vulgaris, syphilis, and lupus erythematosus.

Having now closely observed all that the eye, the touch, the sense of smell, etc., can reveal—in other words, having made, free from preconceived notions, a thorough study of the objective symptoms present—we are better prepared to ascertain the general history of the case, to obtain an account of the patient's own sensations, and, finally, to make use of the various collateral methods of diagnosis that science has placed at our disposal.

Locality.—Many diseases have distinct predilections for special localities. Psoriasis elects the scalp and the extensor surfaces of the elbows and knees. Eczema may occur anywhere, but prefers the flexor surfaces. The excoriations of pediculosis corporis are seen across the shoulder-blades and around the waist. Acne attacks the face and chest. The lesions of scabies are quite constantly present on the webs and sides of the fingers, the flexor surfaces of the wrists, the anterior and posterior axillary folds, the nipples, the umbilicus, the penis, the buttocks, the insides of the thighs and legs, and the toes (in infants). The face is always exempt, except in infants. Erythema multiforme attacks the face, the neck, and the backs of the hands and feet. Erythema nodosum is usually situated on the anterior surfaces of the tibias.

The proneness of common affections to attack special localities is indicated in the following list:

Scalp.—Eczema, ringworm, pediculosis capitis, favus, seborrhea, alopecia areata.

Face.—Acne, eczema, lupus vulgaris, lupus erythematosus, syphilis, impetigo, sycosis.

Chest.—Tinea versicolor, seborrheic eczema, macular syphiloderm, acne.

Shoulders and Back.—Acne, carbuncle, pediculosis corporis.

Buttocks.—Furuncles, scabies, congenital syphilis, eczema intertrigo.

Genitals.—Eczema, pruritus, herpes simplex, scabies, syphilis.

Lower Extremities.—Purpura, ecthyma, eczema rubrum, erythema nodosum.

Age, Sex, and Social Condition.—Some diseases of the skin are more prone to attack children than adults, and vice versa. Epithelioma usually appears first in middle or advanced life, while lupus vulgaris nearly always dates from childhood. Neither acne nor tinea versicolor is common in children, but ringworm of the scalp shows a predilection for that age and usually spares the adult. Ichthyosis is practically congenital. Lupus erythematosus is more frequent in women, and epithelioma of the lower lip is generally an affection of the male.

A knowledge of the occupation is sometimes a help in diagnosis. Bakers, grocers, bricklayers, plasterers, and barkeepers suffer from eczema, and artisans who handle chemicals and other irritants exhibit various grades of dermatitis. Hostlers may contract glanders, and wool-sorters become infected with anthrax. Pediculosis is more common in the poor and unclean than in the upper classes of society.

Antecedent History.—The past history of the case will inform us as to former attacks of cutaneous or other diseases; and if the information is judiciously elicited, may throw much light on the present condition. This is of prime importance, especially in syphilis.

General Symptoms.—The general symptoms of the patient must not be neglected. His facial expression, his gait, the color of his skin and conjunctivæ, the state of the tongue, stomach, and bowels, etc., must be thoroughly investigated. The thermometer will show the body temperature, and microscopic and chemic investigation will determine the condition of the blood and urinary secretion, thus proving or disproving the existence of diabetes, nephritis, and malaria, each of which may be potent factors in the etiology.

Microscope.—Aside from the employment of the microscope in the conditions just mentioned, this instrument is an invaluable aid in dermatologic practice. With it the character of tumors may be determined and information furnished as to the nature of obscure pathologic processes. It is of especial utility in recognizing the presence of fungi or of animal parasites, and in the investigation of the rapidly extending class of bacillary diseases.

Drug and Feigned Eruptions.—The ingestion of various drugs produces in many persons diverse lesions of the skin, and a careful inquiry should always be made in that direction. The same observation may be applied in regard to certain foods: *e. g.*, urticarial and erythematous rashes are often due to the eating of strawberries or buckwheat, and eczemas are sometimes at least indirectly connected with the free eating of oatmeal. Many plants set up severe dermatitis, and heat and cold and the X-rays are also responsible for similar conditions. The physician should also be fully aware that feigned or artificial eruptions are not infrequently produced upon themselves by hysterics and malingerers. See DRUG ERUPTIONS.

Subjective Symptoms.—The merely subjective symptoms of a patient are not of paramount importance in diagnosis; still, one must not put aside as of no importance the statements of intelligent persons in matters relating to their own experiences of pain, itching, burning, or other sensations. Very often such statements may be verified by the condition of the integument itself; for example, if itching is severe, the presence of scratch marks will testify to its existence.

SKIN-GRAFTING.—See PLASTIC SURGERY.

SKULL, DISEASES. Hypertrophy.—In ostitis deformans the vault of the cranium is usually immensely thickened. The inner surface becomes irregular, and is marked all over by arborescent grooves; the outer surface remains smooth and even; the diploe disappears, and on section the bone is hard and dense, like ivory. Beyond a gradual increase in the circumference of the head, it does not appear to give rise to any symptoms; no treatment is of any avail. Other forms of enlargement are described under BONES (Diseases).

Craniotabes.—A peculiar form of atrophy of the inner table, known as craniotabes, is occasionally met in infants suffering from rickets. It affects especially the posterior inferior angles of the parietal bones and the tabular part of the occipital bone, probably because of the recumbent position of the child, for a certain flattening of that part of the head is not infrequently noticed at the same time; and in one or two instances in which the disease existed before birth, a similar change has been found on the inner surface of the vertex. The sulci for the cerebral convolutions are unusually distinct, and here and there are marked in their course by little conic pits, which in some places are so deep that nothing but a parchment-like layer of dura mater and pericranium is left; the whole thickness of the bone is absorbed. Sometimes, in addition, there is a granular deposit of new bone under the pericranium on the outer surface, and occasionally a very considerable amount around the fontanels and along the sutures—enough to be felt plainly through the scalp. In all probability it is due to the effect of continued pressure acting on softened hypervascular bone. It certainly may occur independent of hereditary syphilis, although it is often associated with it (*e. g.*, Parrot's nodes), and a few instances are recorded in which other evidence of rickets was unusually slight. The diagnosis can only be made in well-marked cases by the peculiar parchment-like yielding on pressure with the fingers. No special treatment is required.

Caries and necrosis of the bones of the cranium are not uncommon. They are generally the result of syphilitic periostitis or injury, or, very rarely, of tubercle or fevers. The external table is the most often affected; but whether the external or the internal table is involved, the disease seldom extends beyond the diploe, as the two tables have a distinct blood supply. At times, however, complete perforation of the skull occurs. Caries and necrosis in this situation are likely to be followed by septic or infective inflammation of the diploe and its consequences; by suppuration between the bone and dura mater; by meningitis and abscess of the brain; or by thickening of the dura mater, resulting in persistent headache or even in epilepsy. When the skull is completely perforated, the hole is not filled up by bone; and when necrosis occurs, the sequestrum is not invaginated.

Treatment.—Beyond keeping the parts aseptic, providing free exit for the discharges, and removing loose sequestra, little, as a rule, is required. Should pus collect between the bone and dura mater, it must be released by the trephine; and a portion of necrosed inner table may also require the trephine for its removal. Appropriate constitutional remedies for syphilis or tubercle will, of course, also be necessary.

Meningocele and encephalocele are rare congenital tumors, formed by a protusion of the membranes of the brain through an unossified part of the skull. They are believed to be dependent upon hydrocephalus, the excess of fluid in the subarachnoid space or in the ventricles of the brain leading respectively to a protusion of the membranes alone (*meningocele*), or of the brain also (*encephalocele*). In the latter instance the dilated ventricle may extend into the protuding portion of the brain, a condition further distinguished as *hydrencephalocele*. The protrusion is most common in the occipital region, just behind the foramen magnum, between the four centers from which this part of the occipital bone is ossified; next, at the root of the nose, between the frontal and nasal bones; but it may occur in any situation in the course of the sutures, and may even project into the nasal fossæ or into the pharynx.

Symptoms.—In the occipital region these tumors are generally pedunculated and of large size—sometimes nearly as large as the child's head; at the root of the nose they are usually small and sessile. The skin covering them is generally normal. They swell up when the child cries, and can be completely or partially reduced on pressure, the reduction sometimes producing convulsions or other brain symptoms. When they contain fluid only (*meningocele*), they are soft, fluctuating, translucent, and completely reducible on pressure; they rarely pulsate, and are generally pedunculated. When they contain brain matter (*encephalocele*), they are doughy, nonfluctuating, opaque, and only partially reducible; they pulsate, and are usually sessile. They may be mistaken for other tumors of the scalp, but especially for congenital dermoid cysts and degenerative nævi. However, their intimate connection with the bone, their situation in the course of the sutures, and their partial or complete reducibility, together with the facts that they swell up on expiratory efforts and occasionally pulsate synchronously with the brain, will usually serve for their diagnosis. Further, the hole in the skull may at times be detected and brain symptoms may be produced by pressure.

Treatment.—As a rule, they should be let alone, or merely supported by a pad or bandage. A meningocele, when pedunculated, and apparently communicating with the interior of the cranium by a small aperture only, may be injected with Morton's fluid, or, under exceptional circumstances excised.

Fungous tumors, generally of a sarcomatous nature, and springing either from the tissues of the scalp or pericranium, or from the diploe or dura mater and then penetrating the bone, are occasionally met, and may be mistaken for inflammatory affections of the pericranium or bone, or for syphilitic gummata. Their rapid growth, resistance to syphilitic remedies, the escape of blood only on puncture, and the concomitant loss of weight and strength of the patient, will usually serve to distinguish them; but an exploratory incision may in some cases be necessary to clear up the diagnosis. Secondary tumors which pulsate and have the structure of thyroid gland tissue are also occasionally met in cases of malignant goiter.

Treatment.—When there is no evidence of dissemination, and the tumor is small and fairly circumscribed, it may be removed. When growing from the scalp, this can usually be done without much difficulty; but when the growth arises from the bone or dura mater, a much more serious operation will, of course, be required, since a considerable portion of the skull will have to be cut away and the dura mater probably opened. It need hardly be said that the strictest antiseptic precautions must be observed (Walsham).

Osteomata.—Those tumors growing from the outer table are sometimes called exostoses; those from the inner table and the diploe, enostoses. Most of the latter are, however, inflammatory, and probably syphilitic. Cancellous exostoses upon the cranium are rare; ivory exostoses are more common, growing chiefly from the frontal bone and in the external auditory meatus. Sometimes they are multiple and symmetric. As a rule, they are of very slow growth, and require no treatment; but when they grow in the frontal sinus, they may cause the most fearful disfigurement from displacement of the eyeball, or even more serious symptoms from pressure upon the brain; while in the ear they may lead to deafness, and ultimately to complete obstruction of the meatus, with its consequences (acute suppurative ostitis and meningitis), if the secretion collects behind and decomposes. Fortunately, it frequently happens that the necks of these growths are much more slender than would be imagined from their size, so that they have even been known to break off. As a rule, they can be detached with a drill fitted to a surgical engine; but very great care is required in the selection of proper instruments. In one or two instances the growths have detached themselves, like the antlers of a stag, the vascular canals in the neck gradually becoming smaller and smaller until at length the blood supply is altogether cut off.

SKULL, FRACTURES.—Fractures of the skull are usually due to direct violence. The vault of the cranium generally receives the blow, and hence is most often fractured. If, however, the force is diffused over a wide area, the skull is compressed, the most inelastic and unyielding part gives way, and a fissure is produced which generally runs across the base as well as the vault.

Simple Fractures of the Vault.—Of themselves, simple fractures of the vault are of little or no consequence: contusions, fissures, and fractures without displacement do not admit of proof, and even when the bone is comminuted and the depression considerable, the diagnosis is often only a conjecture, owing to the amount of blood extravasated. Their gravity arises from the fact that serious injury to important structures is so often associated with them. Concussion or contusion of the brain, hemorrhage between the membranes, or, especially if the course of the fissure traverses the middle meningeal artery, between the dura mater and the bone, rupture of the venous sinuses, and laceration of the membranes are of frequent occurrence after simple fractures; more rarely the contents of the cranium (the cerebrospinal fluid at least) find their way out, and form a soft, fluctuating, and pulsating swelling underneath the aponeurosis—cephalhydrocele. Later, especially in cases in which the bone is severely contused, inflammation may set in, although it is very rare in comparison with compound fractures. It may be either acute or chronic.

Compound Fractures of the Vault.—In the majority of instances the nature of the injury can be seen at once. There is a fissure, appearing as a thin, red line, out of which blood continues to ooze, contrasting with the white bone around, or the bone is plainly comminuted and driven in, or the broken edge of a knife or other foreign body can be seen upon the surface. The wound must be carefully and thoroughly explored with the finger, and its extent and the depth and character of the displacement must be made out as accurately as possible, especially in the case of punctured wounds.

Serious complications are much more common in compound fractures. The more nearly a fracture approaches the punctured form, the more dangerous it becomes; it does not matter so much if the depression is wide and extensive, or if, owing to the softness and elasticity of the bones, there is little or no splintering; the dura mater is not injured, and symptoms of compression, merely from displaced bone, are exceedingly rare; but when the inner opening is fringed with a circle of little spikes projecting vertically inward, and tearing and irritating the membranes and the brain, inflammation is almost certain. In addition compound fractures are always exposed to the risk of decomposition. Blood is extravasated into the diploe, and between the dura mater and the bone; the fracture is often comminuted; there are numerous little spaces and fissures between the fragments which cannot drain, and the wound is frequently filled with dirt and other foreign substances. Under these circumstances, unless steps are taken to prevent it, inflammation must follow, and though fortunately it often remains limited to the wound and merely causes necrosis of the broken fragments, it may at any moment spread into the surrounding bone, or, especially if the dura mater has been pricked, into the membranes of the brain, and set up fatal meningitis.

Treatment. *Simple Fractures.*—Unless there are definite symptoms of compression, either growing worse or refusing to clear up, nothing should be done. But if associated with concussion and contusion of the brain, the patient must be placed in a darkened room with the head shaved, and an ice-bag, or, better, Leiter's coil, applied; every source of irritation or excitement should be excluded, the bowels should be opened, preferably with a calomel purge, and nothing but the simplest diet allowed. Rest in bed must be strictly enforced for at least 3 weeks, and the patient must be carefully watched for months. The great fear during the first few days is that hyperemia and inflammation of the brain may occur; after that the chief risk comes from the bone, which may inflame and cause necrosis, meningitis, or pyemia; still later, even years after, symptoms of cerebral irritation may make their appearance, sometimes merely undue excitability or fits of temper, especially if there is any indiscretion in diet or abuse of stimulants; occasionally, but fortunately very rarely, more serious disturbance, such as epilepsy and even insanity.

Compound Fractures.—The wound in the soft parts should be treated as already described; the hair should be shaved off, the scalp well washed, the hemorrhage arrested, foreign matter and dirt carefully removed, and then all the part that has been exposed thoroughly washed out with corrosive sublimate or some other antiseptic. It should then be well dried, the edges dusted over with iodoform and brought together with sutures (catgut is especially useful when there is no tension), leaving suitable openings for the escape of the lymph, and, if necessary, one or two tubes may be inserted. Then it should be carefully covered over with a thick layer of some dressing sufficiently absorbent to soak up any discharge at once, and bandaged to avoid displacement and secure rest. Simple linear fissures, not depressed and not caused by the impact of a sharp weapon, may be covered in at once, the pericranium being replaced if it is torn off. There is no splintering in such a case, no fear of spicules irritating the dura mater and the brain, and the sooner the fracture is converted into a simple one, the less the risk of decomposition and suppuration. Punctured fractures, on the other hand, should always be trephined, the wound in the outer table being included in the circle of the instrument. It is impossible to ascertain the condition of the inner table; in nearly every case it is "starred" and the splinters driven inward; the operation adds nothing to the gravity of the case, and deep punctured wounds passing through strata of different consistence can neither be cleaned nor drained.

In compound depressed fractures portions of bone that are detached or loose or driven into the substance of the dura mater must be picked out, avoiding any unnecessary violence or persistence. If there are symptoms of compression, or if the size and depth of the wound make it probable that the inner table is splintered, the bone must be elevated and, if necessary, part of a circle removed with the trephine, the pin resting on the uninjured margin. See Brain (Injuries).

Fracture of the base of the skull is sometimes the result of direct violence—when, for example, a revolver is discharged into the mouth, or a stick is forced through the roof of the orbit, or the condyle of the jaw is driven through the glenoid fossa. More often it is caused by a fissure extending from the vault. The fracture starts from the point that is struck, and generally passes across the base of the corresponding fossa, sometimes when the force is great involving more than one. The middle fossa suffers the most frequently, as may be expected, and a very common course for the fissure to take is across the petrous portion of the temporal bone and the internal auditory meatus. Occasionally it is produced in other ways. The skull, for example, may be driven down on the vertebral column, just as a hammer-head is forced onto the shaft, with such violence as to break the bone around the foramen magnum; or, as it falls upon the head, the vertebral column may be driven against the skull. In fracture by *contre-coup* the injury is on the opposite side of the head, at the other end of the diameter. The orbital plate of the frontal bone, for example, is sometimes fissured from a fall upon the occipital region. The skull is suddenly shortened in its anteroposterior diameter, and correspondingly widened in its lateral and vertical ones; both the frontal and the occipital regions are flattened out; but the former, being the thinner, more brittle, and less regular in its elasticity, gives way first. It must not be forgotten that fractures extending into the ear, nose, and pharynx are really compound.

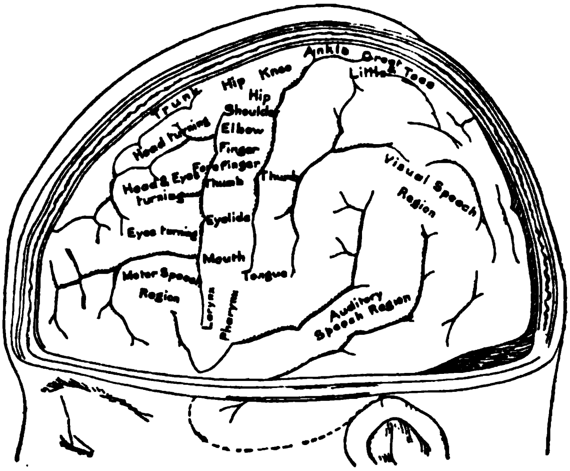
Symptoms.—Sometimes there are no distinctive signs, and the condition is overlooked. It is often confused with drunkenness. Generally, however, there are present the symptoms of compression or other severe lesion of the brain. The signs considered especially diagnostic are (1) the escape of cerebrospinal fluid from the ear, nose, or mouth, or from an open wound if it exists; (2) the similar escape of blood; (3) effusions of blood under the conjunctiva, about the mastoid process or suboccipital region; (4) injury of one or more cranial nerves.

Prognosis is always grave, the cases generally, but not always, terminating fatally from concomitant injury or inflammation of the brain.

Treatment.—Fractures of the base of the skull must be treated in the same way as fractures of the vault; the brain is always severely injured, and the greatest care must be taken to ward off any source of irritation. If the cribriform plate of the ethmoid is comminuted, an attempt should be made to remove the fragments, either through the orbit or the nose, for fear of the dura mater being injured, and to insure more perfect drainage. The discharge is certain to become purulent—unless drained and antiseptically irrigated—and is usually exceedingly offensive, especially if the injury is followed by necrosis. In the case of the ear, the meatus should be gently syringed out with an antiseptic, and then covered with a large pad of absorbent cotton, renewed as often as required. The fracture is compound, but meningitis rarely follows. Callus is scarcely ever thrown out, the parts lie absolutely quiet, and there is no irritation; in many cases union is by fibrous tissue only; and the edges of the fracture become smoothed down and absorbed to some extent, so that the fissure, when the skull is macerated, appears much larger than it really was. See Skull (Surgery).

SKULL, SURGERY.—Conditions calling for cranial surgery are cerebral abscess, tumors, injuries, hydrocephalus, idiocy, general paralysis, and severe cephalalgia and intracranial hemorrhage.

The tumors are glioma, psammoma, localized tubercular lesions, syphilitic scars that drugs cannot absorb, scar tissue and cystic formations following injury, and parasitic cysts. Sarcomatous and carcinomatous growths are usually too extensive for removal, or are multiple from the first. Moreover, since they have no capsule they are not sufficiently distinguishable from the surrounding brain-substance to insure their complete excision and their nonreturn in the scar.

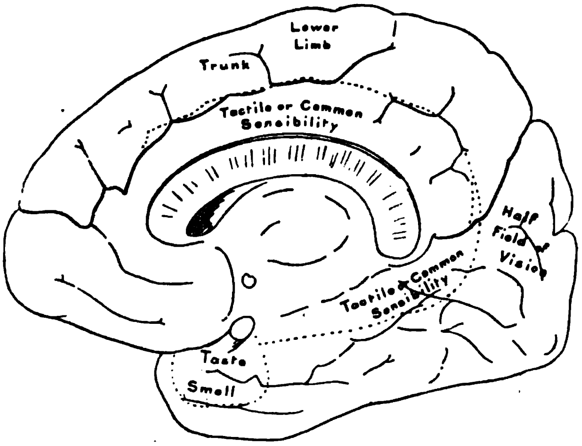


Areas on the Convex Surface of the Cerebrum.—(*Horsley and Russell.*)

Symptoms.—The chief signs of a cerebral tumor are vomiting, persistent headache, optic neuritis, localized spasms or paralysis, and epileptiform convulsions, and convulsive seizures usually starting in the part connected with the cortical area involved in the growth (Jacksonian epilepsy).

Localization.—Among the symptoms that may enable the surgeon to localize the growth are the following: (1) If at the beginning of the epileptiform fit there are: (*a*) Pain, peculiar sensation, flexion, or hyperextension of the great toe, a lesion of the leg area on the opposite side of the cortex about the upper end of the fissure of Rolando close to the middle line is indicated; (*b*) movements of the shoulder, a lesion near the upper part and in front of the fissure; (*c*) flexion of the thumb, a lesion about the genu of the fissure; (*d*) turning of the head and eyes to the opposite side, a lesion about the hinder portion of the superior and middle frontal convolutions; (*e*) movements of the mouth and tongue, a lesion about the lower end of the fissure of Rolando. An epileptiform movement starting in one of these parts may be followed by loss of power in the part for some time after the fit. (2) Aphasia indicates a lesion of Broca's convolution. (3) Loss of half the fields of vision in both eyes points to a lesion of the angular gyrus of the side opposite to the lost fields of vision. (4) Loss of hearing suggests a lesion of the two upper temporosphenoid lobes. (5) Aid to localization may also be derived from the involvement of the cranial nerves (Walsham).

When, from a consideration of the foregoing symptoms, a tumor or new growth is believed to be fairly circumscribed and in an accessible situation the skull should be trephined, a sufficient portion of the bone removed to fully expose the growth, by a Hey's saw, Gigli saw, Hoffmann's, Keen's, Dahlgren's or Hudson's forceps, or the surgical engine, and the growth cut away by making perpendicular incisions into the brain around it, and raising it by means of a sharp spoon. Many experienced brain surgeons, notably Horsley and Krause, make use of the osteoplastic flap method, which consists in raising a flap composed of both soft tissues and bone, the latter being cut through along the line through which the former are incised, and the base then fractured by leverage and raised with the superficial tissues. It is frequently advisable to do the operation in two stages, allowing an interval of six to fourteen days between the formation of the flap and the removal of the tumor. When the operation is thus done, the flap is replaced and held in position by means of deep sutures. Whenever the operation is begun with the intention of completing it at one sitting a rim of bone at least one centimeter in breadth must be cut away (Krause). In order to prevent bony union the blood-pressure should be taken at the beginning of the procedure and every few minutes while the surgeon is operating; any decided fall should be considered a danger signal and the operation either hastily completed if it be already almost done, or abandoned to be finished at another time. The mortality in operations for cerebral tumors is high under all circumstances, but statistics show it to be less in those cases in which the operation is done in two stages than in those in which it is completed at one séance.



AREAS ON THE MESIAL ASPECT OF THE CEREBRUM.—(*Horsley and Russell.*)

The removal of a portion of the cortex will be followed by loss of function of the area removed, but this will be regained to a great extent by the aid of the surrounding areas, especially as regards the coarser movements. The finer movements of the fingers and thumb will not be completely regained; hence in this region the removal of cortex should be as limited as is consistent with success. Parasitic cysts should be drained.

In focal epilepsy, that is, epilepsy without obvious gross lesion—when the fits become very frequent—for example, more than one an hour—and the mental processes are becoming further impaired, the focus in the cortex representing the initial movements may be exposed, the exact spot for the initial movements found by exciting the brain with the faradic current, and this area of the cortex excised. After such an operation a diminution in the number of fits as well as an improvement in the health of the patient may be expected.

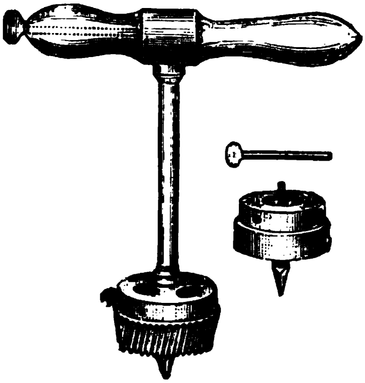
In general paralysis trephining in a few cases has been of some benefit in the early stages of the disease. Thus the hallucinations have disappeared, and the patient has so far improved as to be fit to be set at liberty.

In severe cephalalgia, incapacitating the patient for work or preventing sleep, trephining may give relief. In such cases an exostosis, a spicule of bone, an enlarged Pacchionian body, or a fibrous tumor or cyst of the dura mater has been found, and its removal has been followed by complete recovery. In other cases when a tumor, etc., of the brain that did not permit of removal has been discovered, the relief of pressure has freed the patient from the excessive pain or threatened blindness.

Hydrocephalus, especially when accompanied by fits, when progressive atrophy of the optic nerve threatens, or when dementia or coma supervenes, may be treated by tapping the ventricles at intervals and applying slight pressure to the skull, or, if this fails, by continuous drainage of the ventricles.

Microcephalus combined with idiocy, due, it is thought, to too early synostosis of the cranial sutures, especially the sagittal and coronal, may be benefited by craniectomy—*i. e.*, the removal of a strip of bone on either side of the middle line of the skull. The aim of the operation is to allow the brain, the development of which has been prevented by the early synostosis, to expand. See CRANIECTOMY.

Trephining.—Trephining is an operation required for the relief of (1) injury; (2) abscess, especially following ear disease; (3) tumors, including cysts; (4) trigeminal neuralgia. *After injury* it is required for (*a*) All cases of compound depressed fractures, including punctured wounds, gutter fractures and grazing of the skull by bullets. (*b*) Simple or subcutaneous depressed fracture in children if at all marked, whenever over the region of the sensorimotor areas, also for depressions occasioned during birth which tend to cause irritation and epilepsy. (*c*) Localized intracranial hemorrhage, particularly from rupture of the middle meningeal artery. (*d*) Signs of increasing intracranial tension or of suppuration, whether localized or not. (*e*) In late results of injury, localized pain and tenderness, and for focal epilepsy. If a wound of the scalp exists, it should be enlarged, otherwise a large semicircular flap of the scalp should be turned down, so that when it is replaced after the operation, the trephine hole is completely covered. The pericranium having been turned back from the bone, the trephine, with the pin protruded 1/10 of an inch, should be applied, and steadily worked, clearing the teeth from time to time with an aseptic sponge or the brush provided for the purpose in the trephine case. A good groove having been formed in the bone, the pin should be withdrawn. When the diploe is reached, which may be known by the bone-duct being soft and red, greater caution must be used, and a quill or probe introduced into the groove at intervals to ascertain whether perforation has taken place at any situation. When the crown of bone is loose, it should be removed with the sequestrum forceps, and if it is intended to replace it, it should be kept warm in some weak antiseptic solution, and at the end of the operation cut into small pieces and placed in the hole, and the flap laid down over it. If more room is necessary, the trephine hole may be enlarged by a Hey's saw, Hoffman's or Keen's forceps, or by the surgical engine. The strictest antiseptic precautions should be used throughout. Thus, the whole scalp should be shaved, and washed with soap and hot water, then with ether, turpentine, or ammonia, to remove all grease, and afterward with perchlorid of mercury or other antiseptic. Healing by first intention should be obtained if possible by accurately uniting the wound—except perhaps at its lowest part, which may be left open for drainage—and by applying a dry antiseptic dressing, and over it an ice-bag to prevent inflammation. The trephine should not be applied, as a rule, over a suture, an air or venous sinus, or over the middle meningeal artery, unless the operation is undertaken with a view to secure that vessel. The conic trephine of Walsham will be found a safer instrument than that in ordinary use, as with it the dura mater is less likely to be injured, and the handle also is more comfortable to work with. It can now be had with a metal handle and the improved button-pin. Before trephining for the removal of a cerebral tumor morphin should be given, as it causes contraction of the small blood-vessels, and so has a tendency to lessen the hemorrhage. See CRANIOMETRIC POINTS.



SLEEP, DISORDERS.—See INSOMNIA, NIGHTMARE, SOMNAMBULISM, SLEEPING SICKNESS, etc.

SLEEPING SICKNESS, Definition.—The human trypanosomiasis endemic in Africa, the terminal stage of which is characterized by somnolence, torpor, and coma.

History.—Sleeping sickness was known and described in Africa as far back as 1800 A. D. The disease at that time was confined to a few endemic areas, but of late years it has become widespread on account of the opening up of new areas of trade and travel over tropical Africa. Prior to 1903, the disease was known by its clinical symptoms only. In 1901, Forde discovered an intracellular protozoal organism in the blood of an Englishman, who had spent 6 years on the Gambia river in British West Africa. Dutton recognized and described the parasite as a new species of trypanosome infecting the blood of man. In 1902, Dutton and Todd found the parasite in 6 cases out of 1043 natives in the Gambia. In 1898, Brault had suggested that sleeping sickness might be caused by a trypanosome, but the relation between the two was not made until 1903, when Castellani demonstrated the trypanosome in the cerebrospinal fluid of patients suffering from sleeping sickness. Since Castellani's discovery, the disease has been investigated by numerous Commissions, whose reports cover in great detail every phase of the subject.

Geographical Distribution.—Sleeping sickness has not been discovered outside of equatorial Africa. The limits of the disease on the west coast are the Senegal on the north and Mossamedes in Portuguese West Africa on the south. Along this coastal territory, the distribution is decidedly irregular. In some places a large percentage of the native inhabitants are infected, while other districts are comparatively free. The basins of the Senegal, Gambia, Niger, Congo, and head waters of the Nile rivers are infected. No cases have been reported from the Zambesi. In the interior whole tribes have been destroyed.

Around Lakes Albert Nyanza and Victoria Nyanza the majority of the native inhabitants have perished. The east coast of Africa is free from the disease and no cases have originated within 400 miles of the coast. Outside of the endemic area both natives and Europeans have been diagnosed as suffering from the disease, but inquiry has always led to a history of residence within the infected area. Within this area there are many places endemically free. The low-lying banks of streams and shores of lakes of those localities, whose native inhabitants live near the water, harbor the infection in a particularly virulent form. In the West Indian slave trade days, there were many cases of sleeping sickness among the West African negroes imported from Africa, but the disease never became endemic and no cases of sleeping sickness are known to have occurred in any native born West Indians.

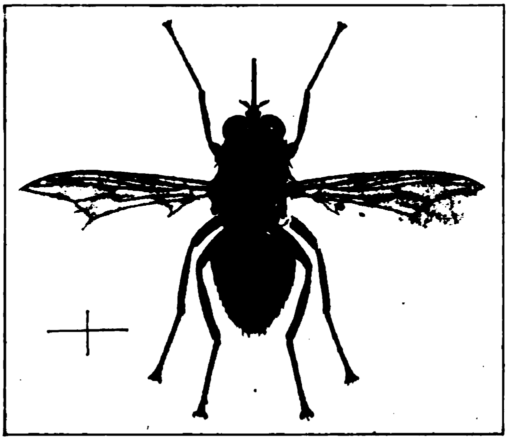
Predisposing Causes.—Before any series of exhaustive observations had been made, it was believed that the natives alone were liable to infection. This has been disproved and it is now known that all races and both sexes are equally liable, providing exposure to the infecting agent has taken place. The white inhabitants of an infected district are less liable to contract the disease than a native on account of the protection rendered by his clothing and different mode of life, but there is a large series of cases on record now of the disease in both white men and white women. Age seems to have no influence upon liability to infection, and among natives of an infected area, all ages are seen suffering with the disease.

Etiology.—Prior to the establishment of the fact that sleeping sickness is the terminal stage of human trypanosomiasis, many theories had been advanced to explain the disease, and it had been considered at various times by different observers, a manifestation of bacterial, filarial, strongyloides, and hook-worm infections. Chronic food poisoning had also been incriminated. Castellani's discovery in 1903, of the trypanosome in the cerebrospinal fluid of sleeping sickness patients has been confirmed by many workers, and now the entire cycle of infection with the transmitting agent is known, with the exception of a few minor points.

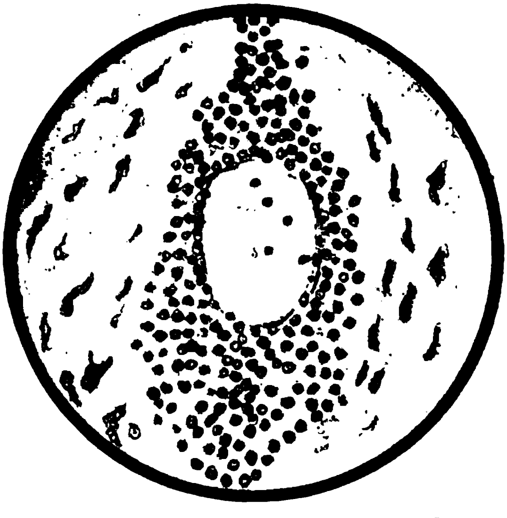
The Parasite.—After the recognition of the parasite in Forde's case it was named trypanosoma gambiense. Nepveu had first seen the parasite in the blood of man, but his description is imperfect. Castellani gives its dimensions as from 16 to 24 microns long, and from 2 to 5 microns broad. Anteriorly it is either pointed or rounded and along one border is an undulating membrane, which is a thickening of the ectoplasm. This is continued posteriorly into a free flagellum. The origin of the undulating membrane takes place from a minute spot of nuclear material of oval shape, called the kinetonucleus, situated near the anterior end of the trypanosome. About the middle of the body of the parasite is an oval mass of nuclear material, irregularly shaped, called the trophonucleus. A few chromatin granules may be seen posterior to the trophonucleus, and the cytoplasm is continued in a narrow diminishing band for some distance along the flagellum. In Castellani's report in the Reports of the Royal Society on Sleeping Sickness are pictured besides the ordinary forms, multinucleate, polyflagellate, and nonflagellate forms.

Occurrence of Parasite in Man.—The main facts of the life cycle of the parasite have been worked out but there are still a number of unknown points. In man the trypanosome is found in the peripheral circulation, the cerebrospinal fluid, and the lymph nodes of cases of sleeping sickness at various times during the progress of the disease. The majority of observers believe that the parasite is found in the peripheral circulation and lymph glands during the early stages (the so-called trypanosomatic fever); and that the invasion of the cerebrospinal fluid marks the beginning of the later stages. Various methods have been devised for demonstration of the trypanosome in the blood of man. Unless the trypanosomes are quite numerous they will be overlooked in the ordinary fresh blood preparations; the use of a large hanging drop, searching from 10 to 15 minutes, will give positive results in a larger percentage of cases in the early stages. The trypanosome may be located first with the low power of the microscope by the movements of the red blood cells as they are lashed by the flagellum of the parasite. Further investigation should then be made with the high power. The surest method of demonstration in fresh blood preparations is by the use of the centrifuge. About 10 c.c. of blood are drawn in the usual manner from a vein at the bend of the elbow. This is drawn in 1 percent sodium citrate in normal salt solution to prevent coagulation, centrifuged three times and the third or fourth residue examined. For staining blood preparations the various modifications of the Romanowsky stains give very good results. Koch, in his work on Lake Nyanza used a heavy drop of blood, which he stained with a dilute solution of Giemsa's stain. In the hands of experts, this is a very reliable method, but one or two trypanosomes may be overlooked on account of their being concealed by red blood cells and fibrin. During the latter stages of the disease the trypanosomes may be demonstrated by examination of the cerebrospinal fluid obtained by lumbar puncture. In examining the cerebrospinal fluid, fresh and stained preparations are made and if these are negative, the fluid is centrifuged and the sediment examined. The lymph nodes and channels contain the trypanosomes at a very early stage of the disease and puncture of an enlarged lymph gland is the most certain method of demonstrating the parasite. A technic of gland puncture used by Grieg and Gray has given most satisfactory results. An enlarged gland of the posterior cervical chain is grasped between the thumb and index-finger and punctured by a sterile hypodermic needle. Then the barrel of the instrument is placed on the needle and the latter withdrawn. The drop of gland juice may thus be expressed upon a slide and examined as a fresh or stained preparation. Artificial culture of the trypanosome of sleeping sickness has not been successful, although they were kept going for 68 days by Thomas and Breinl.

The Transmitting Agent.—After the discovery that the trypanosome was the cause of sleeping sickness, it was soon noted that the distribution of the disease in the endemic foci was limited to those areas in which a certain species of the tsetse fly was found. There are ten species of this fly in Africa, but only one species, *Glossina palpalis*, has been proved to be the transmitting agent of the Trypanosoma gambiense of man. In appearance, *Glossina palpalis* is a dark colored fly, about 8 to 12 mm. long. A point of recognition is the arrangement of the fly's wings in the resting position. They overlap like a pair of scissors. This point differentiates the tsetse fly from other blood-sucking diptera with which it is associated.

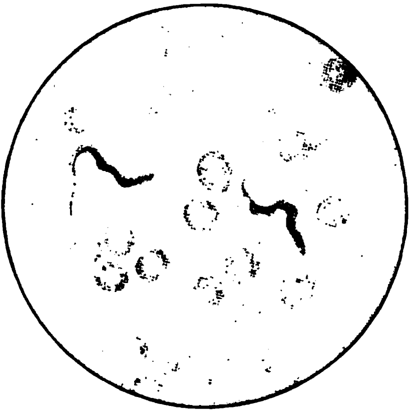


Glossina Palpalis.—(*Adapted from Wellcome Research Laboratory Reports.*)

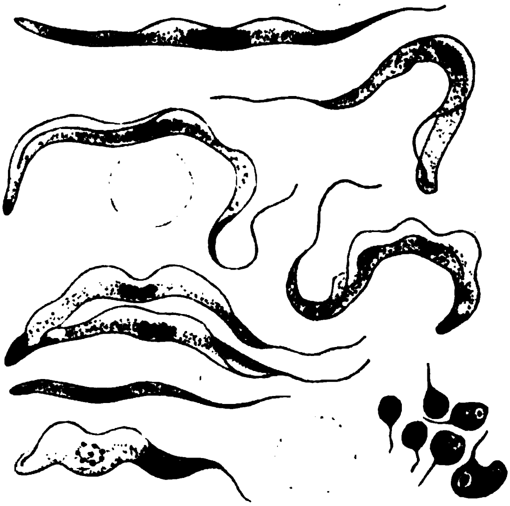


Perivascular Infiltration of Lymphocytes in Sleeping Sickness.—(*Mott. B. M. J.*, Dec. 16, 1899.)

Distribution.—The tsetse flies are limited to Africa. The *Glossina palpalis* is found along the west coast from about 13° to 15° south of the equator. In the interior it is not found farther north than 8° in the Anglo-Egyptian Soudan, nor farther south than 12° on the Luapula river in northeast Rhodesia. It is found in Angola, Congo State, The Gambia, Gold Coast, Ivory Coast, Lagos, North and South Nigeria, Prince's Island, Sierra Leone, Anglo-Egyptian Soudan, Uganda, Northeast Rhodesia, Togoland, Senegal, Niger, French Guinea, French Congo, Dahomey, and the Gaboon. It is very numerous on Lakes Victoria Albert and Albert Edward. Lake Tanganyika and Mveru. It is not found on the east coast nor within approximately 400 miles of it.



Trypanosoma Gambiense in Human Blood.—(*Schleip.*



Forms of Trypanosoma Gambiense seen in Blood and Cerebrospinal Fluid.—(*Adapted from Manson's Tropical Diseases.*)

Habitat, Habits, Method of Propagation.—All of the glossinæ are typical sanguiverous diptera, and they bite all mammalia. In examining the intestinal contents of a large number of *Glossinæ palpales*, Koch found red blood cells from crocodiles most frequently, and from man next. Avian blood was found very rarely. The flies only bite during the daytime from sunrise to sunset. The Portuguese Commission working on Prince's Island reported that they were less liable to bite during the mid part of the day, but observers in other parts of Africa lay no stress upon this point. Both male and female flies bite, and they seem to prefer a dark to a light surface. The optimum habitat of the fly is a loose soil, well shaded, bordering a lake, stream, or pool, with a temperature range of 25° to 30° C. and a high degree of humidity. It is not found in the dense jungle where the ground is always shaded nor in clear places where there is no shade. It has not been found above an altitude of 4000 feet. Hodges considered that the natural range of the fly was about 30 yards with a following range of very long distances. The native boats and caravans distribute these flies over a wide area by mechanical transmission and it is by this method that human trypanosomiasis has been so widely spread during the past 10 years. Dutton and Todd, on the Congo, believed that the natural flight of the fly was a considerable distance, and Roubaud on the same river reported that it would attack passengers on boats a mile from shore. The flight of the fly is swift and there is a buzzing sound. Clothing is a fairly adequate protection against the bite of the fly, but observers report that it can bite through socks, white drill or duck, khaki, and flannel shirts. There is little or no pain accompanying the bite, and little or no irritation follows. The female *Glossina palpalis* gives birth to a larva every 9 or 10 days. This larva buries itself in the loose soil, crevice of a tree trunk, or decaying mass of vegetation, and changes to the pupal stage. Both larvæ and pupæ are killed by prolonged exposure to water, and if shade is removed, they die under the direct rays of the sun. In 32 or 33 days the pupa hatches.

Cycle of Trypanosoma Gambiense in the Fly.—The French Commission working in the Congo believes that for the transmission of the trypanosome over long distances, the *Glossina palpalis* is necessary, but for the transmission from one individual to another, such as would take place in a native family inhabiting the same hut, other biting insects may mechanically transmit the trypanosome. Bruce, working with Nagana, the trypanosomiasis of cattle, could discover no trace of the trypanosomes in the proboscides of tsetse flies later than 1 hour after they had bitten infected animals. Munchin, Gray, and Tulloch found no trace of trypanosomes in the bodies of infected flies later than the third day after infection. During the 3 days after infection, trypanosomes were found in the midgut of the fly. Kleine, working with *Glossina palpalis* and Trypanosoma gambiense on experimental animals concluded that *Glossina palpalis* is a true host of the trypanosome. Some of the flies were able to infect laboratory animals immediately after biting. They lost this ability to transmit the trypanosome for about 18 days, when they were able to infect experimental animals again. The duration of the period of infection is unknown. Two years after the native population had been removed from the shores of Lake Victoria, the British discovered that the tsetse flies were still infective to experimental animals. There is a possibility in this case of the flies finding new infection in natives. If this source could be barred, there would remain the possibilities of (1) a reservoir of human trypanosomiasis existing in some animal, (2) the life of a tsetse fly extending over 2 years, (3) and hereditary transmission of the trypanosome in the fly. Both dogs and monkeys are infective and the disease runs a fairly rapid course of about 2 months in the former and about 12 months in the latter. In the laboratory animals, the infection runs a more chronic course.

Symptoms.—For purposes of description, the course of the disease is divided into three stages. During the first stage the parasite is present in the peripheral circulation and in the enlarged glands; the second stage is marked by an invasion of the cerebrospinal fluid; and in the third stage, the symptoms of serious nervous involvement are seen.

First Stage.—In blacks there may be no symptoms. In a reported case of a European, there was fever, irregular in type, accompanied by irritability, insomnia, headache, and loss of strength. This persisted for 15 to 20 days, then there was an improvement. The fever persisted, however, coming on at irregular intervals, with a tendency to rise at night. During this stage there is an acceleration of the pulse, which is distinct from the febrile rise. The pulse rate at this stage is often 120. During the second and third months, Kérandel's sign of deep hyperesthesia is noted. Kérandel in describing this symptom said that ordinary contact with objects, such as would pass unnoticed in a normal individual caused very severe pain. In Europeans, an erythema appears which may have an irregular distribution. This skin eruption may not be noticed in the blacks. Fugitive and painful patches of transitory edema on face and ankles may be present. Loss of sexual power in men, and amenorrhea in women are common. Anemia, loss of flesh, headache, itching, may be present. Iritis and cyclitis have been noted and blacks complain of photophobia and sensations of mist. Vomiting, colic, bloody diarrhea may occur. Adenitis is sometimes absent, but in the majority of cases there is a painless enlargement of the cervical glands. Polyadenitis may be present.

Second Stage.—The symptoms of the first stage are accentuated. The anemia is more pronounced, the headaches more frequent and severe. Patches of edema are more constant. The febrile attacks occur oftener and finally there is a daily afternoon rise of temperature. During the course of the disease, the temperature seldom arises above 103° F. There is a gradual change of character, with intellectual apathy and a tendency to drowsiness. Fibrillary tremors of the tongue appear, which may interfere with speech. Tremors in the arms, when extended, may be present. Zones of anesthesia and hyperesthesia and muscular atrophy are reported. There are attacks of giddiness and the gait may be hesitating. It is reported that during the first part of this stage, Romberg's sign is absent, later it is present, and finally the patient must stand upon both legs with eyes open to keep from falling. Martin, Guillain, and Darré describe a medullary (spinal) and a cerebrospinal form, in the former there being loss of sensation and motion, and in the latter, mania and hallucinations.

Third Stage.—In the final stage the nervous symptoms show that serious structural changes have taken place in the cerebrospinal axis. The intellectual apathy is extreme and somnolence has given place to torpor. There are tremors, and convulsions may take place similar to Jacksonian epilepsy. The patient lies in coma toward the end. The axillary temperature at this time is usually subnormal. Death takes place while in coma, or from some intercurrent disease, such as pneumonia, dysentery, or tuberculosis. It is the third stage which gave the name sleeping sickness to the disease.

Duration of the Disease.—This is uncertain. In one case reported, a European, there was an interval of about one month between known exposure to infection and beginning symptoms. The first stage may last from a few months to a few years. During the second and third stages, careful nursing will prolong life considerably. The length of life of Europeans, after definite symptoms appear, varies from 1 1/2 to several years. In untreated blacks, it may be shorter.

Blood.—All observers agree that there is a relative increase in the lymphocytes. The French Commission reports the following as an average differential count:

Polynuclears,	49.04
Lymphocytes,	36.6
Large mononuclears,	6.36
Eosinophiles,	6.24
Transitional,	.76

The eosinophilia was caused by filariasis. There are no reports of a leukocytosis in uncomplicated cases of human trypanosomiasis.

Pathology.—Bruce reports that the gross appearance of the brain is fairly characteristic of sleeping sickness. He says that "upon removing the calvarium, a great deal of fluid escapes. The dura mater is not adherent and as a rule presents nothing abnormal. On reflecting it, the convolutions on the surface of the brain are found to be flattened and the sulci filled with opaque looking subarachnoid fluid, giving a ground glass appearance. The vessels on the surface are injected. On section, the brain appears normal, but the lateral ventricles are dilated and contain an excess of fluid." The microscopic pathology was worked out by Mott. He reported that the specific lesion was a meningoencephalitis in which there was a perivascular infiltration of mononuclear leukocytes around both large and small blood-vessels of the brain and cord. Bruce concludes that "human trypanosomiasis is essentially a disease of the lymphatic system, and the irritation and proliferation of the lymphocytes is probably due to a toxin, secreted by or contained in the bodies of the trypanosomes. The characteristic symptoms of the disease are no doubt due to the accumulation of these lymphocytes in the perivascular spaces of the brain, compressing the arteries and so interfering with the normal nutrition of the brain cells. The progressive weakness of the body, the tremulous conditions of the muscles, the feeble, rapid pulse, the weak voice and uncertain gait, the rise of temperature, would all be accounted for by this obstruction or interference with circulation, giving rise to degenerative changes in the nerve cells and proliferation of the neuroglia."

Diagnosis.—A tentative diagnosis may be made upon the clinical symptoms; but the absolute diagnosis depends upon the discovery of the trypanosomes in the enlarged cervical glands, in the peripheral circulation, or cerebrospinal fluid, according to any of the methods described under the "**parasite.**" Numerous observers have reported an autoagglutination of red blood cells in cases of human trypanosomiasis, and African workers regard this as a very suggestive sign.

Treatment.—Besides general hygienic measures, which seem to prolong life only, a specific treatment with arsenical derivatives with or without some of the anilin dyes has been made use of. This specific treatment is based on animal experimentation, some of the arsenical derivatives, notably atoxyl, destroying the trypanosomes in the blood of infected animals. Breinl states that the injection of atoxyl and mercury, atoxyl and antimony, and arsenophenylglycin will produce cures in infected monkeys provided careful general treatment is carried out. He concludes that in man, atoxyl by itself affects a permanent cure in comparatively few and exceptionally favorable cases of sleeping sickness. The trend of medical opinion inclines now to a combined treatment with atoxyl and mercury, salts of antimony or some of the anilin compounds, such as trypan-red. Nattan-Larrier gives the results of treatment of eight Europeans. Of those who received general treatment only, one remained well for 17 months and then relapsed, another had a relapse with cerebral symptoms, and the third remained without symptoms two years. Of 5 treated cases, 3 received weekly hypodermic injections of 0.5 G. of atoxyl. There were two relapses and the condition of the third is doubtful. Another case, which relapsed, received atoxyl by mouth and injections of mercury. A case treated with atoxyl and strychnin improved. Atoxyl occasionally causes partial or total blindness. Soamin, a trade name for sodiumaminophenylarsenate is recommended as possessing all of the beneficial effects of atoxyl with none of its deleterious action. Yet cases are reported of optic atrophy from the use of this drug as well.

Prognosis.—The consensus of opinion seems to be that there is a slight prospect of cure provided the case is seen in the very earliest stages, but in the vast majority of cases, there is a fatal termination that may be only temporarily halted by proper nursing with administration of atoxyl or some other arsenical derivative.

Prophylaxis.—This may be either personal or general. Individuals who are obliged to enter the infected districts should wear clothing and face nets which will protect against the bites of the *Glossina palpalis*. The British, French, Germans, and Portuguese are endeavoring to rid their African territory of sleeping sickness by measures, which include the segregation and treatment of infected natives and the destruction of the *Glossina palpalis*. The British removed the natives from the infected areas around the Victoria Nyanza and established sleeping sickness camps where cases might be observed and studied. Koch rid an island in the lake of the tsetse flies by deforestation. The larvæ and pupæ of the fly will not develop unless they are shaded. Deforestation, however, is impracticable, except in certain localities. Travel between infected and noninfected districts has been regulated, and there is some prospect that eventually, the disease may be limited to certain foci.

SMALLPOX (Variola).—An acute, contagious disease, epidemic, characterized by an eruption that makes its appearance first as a papule, then is converted into a vesicle, finally becoming pustular, with the formation of a crust. See also VACCINATION.

Varieties.—(1) Discrete; (2) confluent; (3) hemorrhagic; (4) varioloid.

The period of incubation is from 7 to 12 days.

Etiology.—The specific microorganism of smallpox is probably an intracellular protozoon. Unicellular bodies are formed near the nucleus of the epithelial cell; and its final spores are considered by Councilman to be the true agent of infection. The virulent poison seems to be more abundantly present in the crusts. At this stage it is most highly contagious, is capable of being carried by fomites for great distances, and has the power of causing the disease after long periods of time. The disease is modified by a previous vaccination. One attack generally confers immunity, but subsequent attacks may occasionally take place.

Pathology.—**The eruption** consists at first of a small, hard, red papule, surrounded by a red areola. Within a short time liquefaction necrosis begins, forming a vesicle depressed in the center. The papules seem to originate in the epidermis immediately over the papillæ; it is here that liquefaction necrosis occurs. At the same time there is an exudation of a lymphoid material, through which are seen threads of denucleated cells dividing the vesicle into distinct divisions. In the stage of maturation the rete malpighii is filled with leukocytes and the products of coagulation necrosis. If the suppurative process extends through the cutis, scarring is inevitable. The eruption is very frequently seen on the soft palate and mucous membrane of the mouth and on the tongue. The red blood-corpuscles are greatly diminished; the leukocytes are not affected until the pustular stage; they are then increased.

Internal Organs.—The lungs and spleen are congested. The liver and kidneys occasionally show a degree of parenchymatous degeneration.

Symptoms and Clinical Course. Discrete Smallpox.—The onset is usually marked with a chill, intense frontal headache, and lumbar pains, often nausea and vomiting. In young children convulsions are frequent. The fever rises rapidly to from 103° to 104° F. within the first 48 hours, where it remains until the third or fourth day, or until the papular eruption appears, when it falls several degrees. The eruption is first noticed about the forehead at the junction of hair and on the wrists. The pulse is rapid and full.

The temperature remains low until about the eighth or ninth day, when the pustular stage arrives and there is a secondary rise of temperature—105° F. or more —proportionate to the severity of the attack. There is now great swelling about the face, and the eyelids may be entirely closed. Intense pain is present over the affected area. At this stage a peculiar odor is detected. If the case terminates favorably, toward the twelfth day desquamation begins with restoration of the diseased epidermis.

The Eruption.—It may be said, with due allowance, that the eruption for 3 days remains a papule, 3 days a vesicle, and 3 days a pustule. The papules are at first hard to the touch, and can be rolled around under the skin like a shot. The vesicle is depressed in the center (umbilicated) and is divided by the meshes into distinct compartments (loculated) which, if incised in one portion, all of the fluid will not escape, but only in the mesh in which the incision is made.

Confluent Smallpox.—The onset is the same as in the discrete form—with the papules at first discrete or separate, but later run together. The primary rise of temperature is higher, as a rule, than in the discrete form; and the same is true of the secondary fever, which may also be very irregular. With the rise of secondary fever the suffering becomes more intense, and there may be delirium and stupor, with rapid pulse.

Hemorrhagic Smallpox (Malignant Smallpox).—The primary symptoms are all exaggerated, and instead of the eruption first appearing, there are seen small punctiform hemorrhages about the groins and conjunctivæ, which gradually increase in size until large areas are affected. Hematuria, hemoptysis, and hematemesis are very common. Death usually occurs from the fourth to the seventh day. In this form there is usually no distinct eruption.

Varioloid.—This is a modified form of smallpox occurring in a person who has been previously vaccinated. The symptoms come on very suddenly, with a rise of temperature, headache, and severe pains in the back. The papules, as in discrete smallpox, appear on the forehead and arms on the third or fourth day. As a rule, they are fewer in number than in discrete smallpox. The papules become vesicles within a day or two, then pustules, and finally desquamate; the whole process frequently is completed within a period of 5 or 6 days. See VACCINATION.

Complications.—Bronchopneumonia (most common), laryngitis, pleurisy, iritis, keratitis, conjunctivitis, boils, convulsions.

Diagnosis.—With the appearance of the perfect papule all doubt in the diagnosis of smallpox generally ceases. Ignorance of the inital rashes, measly and scarlatinal, has often led to errors of diagnosis. On the other hand, the resemblance of the eruption of measles to smallpox has also given rise to errors, the result of which has been no less serious; because in consequence, cases of measles have more than once been sent to smallpox hospitals, with disastrous consequences. Never, in measles, is there so severe a pain in the back as in smallpox, while the early cough and coryza are only found in measles. The lesson taught is to defer a positive diagnosis because less serious mischief may result from an error thus occasioned than as the result of an opposite course. The possibility of mistaking relapsing fever for smallpox has been alluded to in considering the former disease. Cerebrospinal fever may also be simulated by the hemorrhagic form of smallpox. Pustular syphilids and accidental croton-oil eruption have been mistaken for smallpox, as has also chicken-pox.

Prognosis depends upon whether or not the person has been vaccinated, upon the character of the epidemic, and upon the season of the year. If there has been a previous vaccination, the prognosis is always good. Occasionally, there is a type of smallpox which is virulent in certain epidemics.

The summer season is always favorable to smallpox, as the room can be kept well ventilated, more comfortable, and there is less danger of complications.

The hemorrhagic type is the most fatal. In young children the prognosis is very unfavorable.

Ominous Symptoms in Smallpox.—Eliot has always noticed, in moving a patient to the hospital, that those who voluntarily covered their faces and heads, without any suggestion to do so, invariably died. When the face of a white patient assumes a dark leaden hue during the first days, death may be predicted almost with certainty. Those patients who present great swelling of the face and head in the beginning always suffer from severe attacks. There is a peculiarity of the walk which is very ominous: the patient lifts the feet high, as if he were ascending stairs, and this applies to the early eruptive stage. The general mortality is from 15 to 30 percent.

Prophylactic Treatment.—The patient should be isolated. If in the summer, a tent answers very well; or a house should be chosen that can subsequently be thoroughly disinfected. Nothing should remain in the room that cannot be boiled and washed in a solution of mercuric chlorid, 1 : 2000. The bed-clothes and bedding should be burned. The furniture, walls, and ceiling should be thoroughly scrubbed with soap and water; then with the solution of mercuric chlorid, 1:2000; and all furniture that can be moved should be sunned for at least a week. All sweepings, cloths, and waste around the yard should be swept up and burned. Burning sulphur and scattering a few drops of carbolic acid about an infected place is a primitive custom, and does no good unless the cause of the evil is removed. Formalin is a good disinfectant. See DISINFECTION.

The physican should wear such outside garments as can be thoroughly washed, and should always change the clothing before attending other cases. His clothing should be kept in an unoccupied room from which all drapery has been removed. It should subsequently be disinfected. After a visit to a patient with smallpox, the face, hair, and hands should be thoroughly scrubbed with soap and water; then with a solution of mercuric chlorid—1:1000 on hands and 1:4000 on face and hair—taking care that the liquid does not come in contact with the eyes. All persons in the immediate vicinity of the patient should be vaccinated. See VACCINATION.

Medicinal Treatment.—In mild cases few drugs are indicated. In no other disease are careful nursing and the proper hygienic precautions more necessary. It is always well to begin the treatment with calomel, 1/4 grain being taken every hour until 5 or 6 doses have been taken, followed by 1/2 of an ounce of Rochelle or Epsom salt. The kidneys should be kept active, and probably there is nothing better than potassium bitartrate, 20 grains of which may be given every 3 or 4 hours. Acetanilid or phenacetin may be given for hyperpyrexia. A light nutritious diet should be given. If the temperature rises above 102.5° F., it may be reduced by the administration of 5 grains of phenacetin; or the following formula may be given:

℞.	Antipyrin,	ʒ jss
	Tincture of digitalis,	ʒ ij
	Peppermint water,	ʒ iij
	Water, enough to make	℥ ij.

One teaspoonful every 3 or 4 hours, if necessary, to reduce fever.

These antipyretics, besides reducing the temperature, mitigate the pain and render the patient more comfortable. If the temperature cannot be satisfactorily controlled, one should not hesitate to use the cold tub-bath. Cool drinks, such as lemonade, assuage the thirst fairly well.

As a diuretic:

℞.	Solution of potassium citrate,	℥ ij
	Sweet spirit of niter, Elixir of curacoa,	each, ʒ iv
	Water enough to make	℥ iv.

One tablespoonful every 3 or 4 hours.

If the nervous system begins to suffer, or if the heart is weak, 1/2 ounce of whisky may be given every 3 or 4 hours. Frequently morphin, 1/4 of a grain hypodermically, may be given to relieve pain and to produce sleep.

Finsen's red light treatment has proved effective in preventing suppuration.

Antistreptococcus serum is recommended in the stage of pustulation.

To Prevent Pitting.—Apply cold cream or vaselin on lint to affected parts. Schamberg found the most efficient treatment to be painting with iodin. Romero advocates picric acid applications (picric acid 30 grains, alcohol 1/2 ounce, water 6 1/2 ounces; or as an ointment). Lint dipped in a solution of mercuric chlorid, 1: 3000, may also be applied.

Quarantine should be enforced for at least 2 weeks.

SNAKE-BITES.—See Bites and Stings.

SNAKEROOT.—See Cimicifuga, Senega, Serpentaria.

SNEEZING.—The causes of excessive sneezing may be broadly classified as extrinsic and intrinsic. Tobacco-snuff and pollen are instances of the former, while the latter occur in association with various affections, as whooping-cough, asthma, hay-fever, gout, hysteria, disordered menstruation, derangement of the sexual functions, and pregnancy. A bright light or an intense color may cause excessive sneezing in some persons. The ingestion of pungent substances may cause violent sneezing. Some individuals exhibit special idiosyncrasy to certain articles of food. For instance, in some, chocolate, eaten or drunk, will provoke sudden sneezing. The inital sneezing in the beginning of an ordinary "cold" needs no mention here. Impacted cerumen may be a reflex cause. Sexual excesses may act similarly.

Treatment.—An attack may be cut short by pressure on some branch of the trigeminal nerve. A mustard poultice to the back of the neck, an emetic, an astringent nasal inhalation or a spray of creosote, iodin, or menthol, or an application to the nasal mucosa of a solution of cocain (3 percent) may suffice. The head may be immersed in cold water. Irregularity in the function of any affected organ should be rectified. One drop of Fowler's solution 3 times daily may be given in paroxysmal sneezing allied to asthma. Potassium iodid, 10 grains several times daily, and iodin inhalations are sometimes used. In incessant sneezing, with profuse watery discharge from the eyes and nose, camphor powder snuffed and an alcoholic solution of camphor inhaled are also recommended. See Asthma, Hay-fever.

SOAMIN.—Sodiumaminophenylarsonate. One of the new arsenical compounds used in the treatment of syphilis. It is almost identical with atoxyl though it is claimed to be more stable and hence safer; but it is less stable and more toxic than arsacetin. Cases of optic atrophy, however, have been reported from its use. Dose, 1 to 5 grains. See Arylarsonates.

SOAP (Sapo).—A chemic compound made by the union of certain fatty acids with a salifiable base. It is used for washing and cleansing purposes. A table is appended showing the composition of the chief soaps of pharmacy, as analyzed by M. Dechan.

Therapeutics.—Soap is a laxative, antacid, and antilithic. Externally, it is a stimulating discutient, and is used for cleansing the skin, removing fatty substances, and softening the epidermis; but if too long applied, it may prove decidedly irritant. It is a good antidote in poisoning by acids, and should be administered freely in such cases until more energetic alkalies can be obtained. In aqueous solution it makes a useful enema for constipation, or a plug of soap may be inserted into the rectum. Soft soap is a powerful detergent stimulant, and is much employed in skin-diseases, especially eczema rubrum, in which the tincture is well rubbed on, the diseased skin well washed and then covered with a bland ointment. The tincture is the most desirable form for use, and may be diluted with 3 parts of alcohol for shampooing the scalp. The liniment is used with friction in sprains, bruises, and stiff joints, being a little more stimulating than camphor liniment. It makes a good basis for extemporaneous liniment prescriptions.

Preparations.—**Sapo** (*white castile soap*) is soap prepared from sodium hydroxid and olive oil; a whitish solid, hard, yet easily cut when fresh, of faint, peculiar odor free from rancidity, a disagreeable alkaline taste and alkaline reaction; readily soluble in water and in alcohol. It is an ingredient of three of the official pills, and two plasters. **Sapo Mollis,** *soft soap, green soap,* is soap prepared from potassium hydroxid and linseed oil; a soft, unctuous mass, of a yellowish-brown color, soluble in about 5 of hot water and in 2 of hot alcohol. The name green soap is a misnomer, as it is not green in color. Insoluble soaps are combinations of the oily acids with earths and metal oxids, as the soap of lime, official as linimentum calcis, and the soap of lead monoxid, the former lead plaster. **Emplastrum Saponis** has of soap 10, lead plaster 90, water *q. s.* **Linimentum Saponis** has of soap 6, campor 4 1/2, oil of rosemary 1, alcohol 72 1/2, water to 100. **Opodeldoc** is a similar preparation. Soap liniment is an ingredient of chloroform liniment. **Linimentum Saponis Mollis,** *tincture of green soap,* has of soft soap 65, oil of lavender 2, alcohol to 100.

Variety.	Fatty Acids.	Combined Alkali.	Free Alkali.	Silica.	Sulphates and Chlorides.	Insoluble Matter.	Water.	Insoluble in Alcohol.
Hard soap (*sapo durus*).	81.5	9.92	0.08	....	0.28	0.20	10.65	0.50
White Castile soap (*sapo Cast. alb.*).	76.7	9.14	0.09	....	0.36	0.90	13.25	0.60
Mottled Castile soap.	68.1	8.9	0.19	0.15	0.63	0.80	21.70	1.30
Tallow soap (*sapo animalis*).	78.3	9.57	0.28	....	0.47	0.40	12.50	1.10
Soft soap (*sapo mollis*).	48.5	12.6	0.38	0.17	0.93	1.00	39.50	1.60

SOAPBARK.—See Quillaja.

SODA-WATER.—See Carbon Dioxid.

SODIUM.—Na = 23; quantivalence, 1; sp. gr., 0.972. A metal of the alkaline group, characterized by its strong affinity for oxygen. It has a silver-white luster, and is softer than lead. It decomposes water, forming sodium hydroxid.

The action of the sodium salts is similar to that of the potassium salts, except that the former are feebler as alkalies, are not so depressant, and are not so poisonous to the cardiac muscle or the nerves. They are diffused more slowly, are neither absorbed nor excreted so readily, and have not so marked diuretic action. Locally applied in large doses to muscular and nervous tissues they are paralyzant, but not so powerfully as potassium salts. **Sodium urate** is not soluble like the urates of lithium and potassium, and is therefore much less readily excreted, forming the masses called chalk-stones in gouty subjects. **Soda** is a less active escharotic than potash, having less affinity for water. **Liquor sodii hydroxidi** renders the blood and secretions more alkaline, but does not alter nutrition to the extent that the potassium solution does. The **acetate** is converted into the carbonate in the blood, and is a less active diuretic than the corresponding potassium salt. The **carbonate** is irritant to the stomach, and is chiefly used in the preparation of the other salts. The **nitrate** is mildly purgative and diuretic, and in solution is solvent to false membranes. The **ethylate** is antiseptic, and a powerful but almost painless escharotic. **Sodium bicarbonate** has the same action as the corresponding potassium salt, except that it is more slowly absorbed and is less depressant. It is antacid, antipruritic, and analgesic, the latter being probably due to the increased alkalinity imparted by it to the blood. Internally in small doses it is neutralized by the hydrochloric acid of the gastric juice; in medium doses it is solvent to the gastric mucus, slightly irritant to the stomach, and sedative to the gastric nerves; in large does it renders the stomach contents neutral or alkaline and stops the gastric digestion.

Preparations.—S. Acetas, $NaC_2H_3O_2$. $3H_2O$, diuretic, a good saline draft. Dose, 5 to 30 grains. **S. Arsenas,** Na_2HAsO_4, used in preparing liquor sodii arsenatis. **S. Benzoas,** $NaC_7H_5O_2$. Dose, 10 to 30 grains. **S. Bicarbonas,** $HNaCO_3$, "saleratus," "baking soda"; antacid; 20 grains neutralize 16.7 grains of citric acid or 17.8 grains of tartaric acid. Effervescent. It is much used for the aeration of bread. Dose, 10 to 30 grains. **S. Bicarb., Troch.,** each contains 3 grains of the salt. **S. Boras,** $Na_2B_2O_7$, BORAX (*q. v.*) **S. Bromidum,** NaBr. Dose, 10 to 30 grains. **S. Cacodylate.** See CACODYLIC ACID. **S. Carbonas, monohydratus,** Na_2CO_3, antacid; 20 grains neutralize 9.7 grains of citric or 10.5 grains of tartaric acid. Effervescent. Dose, 1 to 7 grains. **S. Chloras** $NaClO_3$, the basis of an agreeable gargle. Dose, 1 to 10 grains. **S. Chloridum,** NaCl, common salt. Dose, 10 grains to 1 dram. **S. Cinnamas.** See CINNAMIC ACID. **S. Citras.** Dose, 5 to 30 grains. **S. Ethylas,** C_2H_5NaO, caustic alcohol, unof., in contact with water breaks into caustic soda and alcohol. **Sodium Glycocholate,** an excellent cholagogue, markedly stimulating the digestion of fats. Its dose is 2 to 5 grains. **S. Hydroxid,** Na(HO), "caustic soda," very alkaline and powerfully escharotic. **S. Hydroxid. Liq.,** solution of soda. Dose, 5 minims to 1/2 of a dram well diluted with water, contains 56 parts of the hydroxid in 944 of distilled water. **S. Hypophosphis,** $NaPH_2O_2$ used in preparing syrupus hypophosphitum. **S. Iodidum,** NaI. Dose, 3 to 10 grains. **S. Nitras,** $NaNO_3$, "cubic niter," "Chili saltpeter." Dose, 5 to 30 grains. **S. Nitris,** $NaNO_2$, used in preparing sweet spirit of niter. **S. Oleas.** Antacid and mild laxative. Dose, 2 to 20 grains. **S. Perboras.** Antiseptic and bactericide. A substitute for hydrogen peroxid. **S. Phenolsulphonas,** $NaC_6H_5SO_42H_2O_2$, (sodium sulphocarbolate). Dose, 10 to 15 grains. **S. Phosphas,** Na_2HPO_4, sodium orthophosphate. **S. Pyrophosphas,** $Na_2P_2O_7$, sodium pyrophosphate. **S. Salicylas,** $NaC_7H_5O_3$, sodium salicylate. Dose, 10 to 15 grains. **S. Santonas,** $Na_2C_{15}H_{18}O_4$, a vermifuge for thread-worms. Dose, 5 grains. **S- Sulphas,** Na_2SO_4, "Glauber's salt," a mild purgative. Dose, 5 to 20 grains; as a purgative, ½ to 1 ounce. **S. Sulphis,** Na_2SO_3, sodium sulphite. **S. Thiosulphas,** $Na_2S_2O_3 + 5H_2O$, an antiseptic salt.

SOFTENING OF THE BRAIN.—A disease of the cerebral tissue dependent upon inflammation or blood failure, the symptoms varying according to the part affected, but consisting of loss of function, partial or complete. According to the appearances presenting, the softening has been distinguished as red, yellow, or white. See PARALYSIS (General).

SOLUTION.—See LIQUOR; PERCENTAGE SOLUTIONS.

SOMATOSE.—A preparation in which the albuminoids and nutritive constituents of flesh are converted into soluble albumoses, 5 parts of somatose representing 30 parts of beef in nutritive value. It forms a pale yellowish powder, which is readily soluble in water, forming an almost odorless and tasteless solution. It is employed as a food for patients afflicted with weak digestion, 1/2 to 1 ounce being given in milk, cocoa, or soup.

Iron Somatose (Ferrosomatose).—A preparation of somatose containing about 2 percent of iron in organic composition, and forming a light brown, inodorous, and tasteless powder, readily soluble in warm fluids; it does not attack the teeth or constipate. Dose, 1 to 3 drams daily.

Milk Somatose.—A tasteless, inodorous, strength-giving food-product in powder form, prepared from milk. It contains the albumoses of milk in soluble form with 5 percent of tannic acid organically combined. It is used in chronic diseases of digestive organs such as are connected with inflammation of the stomach and with typhoid conditions. Daily doses for children, 1 or 2 teaspoonfuls; adults, 2 or 3 tablespoonfuls.

SOMNAL.—A hypnotic formed by the union of chloral, alcohol, and urethane. It acts like chloral, but is more pleasant. It occurs as a colorless liquid, resembling chloroform in its behavior with cold water, forming globules and refusing to dissolve or mix. It is soluble in hot water, in alcohol, and in alcoholic solutions 3:1. The advantages claimed for it are that in 20-grain doses it induces a quiet sleep, within a half-hour, lasting for 6 to 8 hours, and with no unpleasant after-effects. Doses of 45 or even of 60 grains do not depress the heart. Doses of 30 grains in solution with syrup of tolu or whisky are well borne and without deleterious effects. Its effects are more striking than urethane and less depressing than chloral. There is no vertigo, as after sulphonal. It is not powerful enough to control delirium tremens, maniacal delirium, or severe pain, but manifests its best hypnotic and sedative action in insomnia of convalescence from acute disease. In whooping-cough, in spasmodic laryngitis and in asthma, in the so-called "nervous cough," in chorea, in melancholia, and in mental depression, it is of much use. It is said to be injurious in general paralysis, and to be contraindicated in cases of impaired digestion.

SOMNAMBULISM.—The condition of half sleep, in which the senses are but partially suspended; also termed sleep-walking. Also the type of hypnotic sleep in which the subject is possessed of all his senses, often having the appearance of one awake, but whose will and consciousness are under the control of the operator. Charcot calls this simply **somnambulism,** which constitutes the third type of the hypnotic state. The second he calls **catalepsy,** produced by the gong suddenly sounded or the electric light suddenly brought before the subject's eyes; the eyes are wide open, and the muscles acquire the curious waxy condition designated as *flexibilitas cerea.* The subject seems to have no mental communication with the outside world. This latter characteristic also distinguishes **lethargy,** or the first type of the hypnotic state, in which there are unconsciousness, irresponsiveness of the senses to stimulation, and a fixed positon of certain muscles. See Catlepsy, Hypnotism.

Somnambulism is pratically confined to childhood and youth. Idiots and imbeciles are rarely affected. There may be no definite symptoms of ill health in the simpler cases. A neurotic temperament or a tendency to disturbances of the nervous equilibrium, such as epilepsy, hysteria, chorea, or migraine may exist. Other cases may be accompanied by mere chargin, anger, or surprise. The eyelids are uually closed, but may be open, and the pupil is dilated. The sense of touch is much exalted, and a sleep-walker seldom runs against furniture, chairs, etc. Some subjects hear well, others do not. The sense of smell varies with the subject. A sleep-walker may enjoy a meal and not remember the fact of having eaten. Sensibility to pain may be entirely suspended. The muscular system is intact, and permits of extraordinary exploits. The ordinary mental processes are active in somnambulists, and elaborate work may be performed. A dream in all probability precedes and accompanies the action taken. Occasionally, the particular dream may be recalled. Vivid hallucinations may arise, determining the particular act to be performed. Speaking and singing are not uncommon.

Treatment.—Treatment is limited to regulating any indiscretions in diet and correcting any gastric disturbance. The best hygienic surroundings for quiet sleep should be obtained. See Insomnia.

SOMNIFACIENTS.—See Hypnotics.

SOMNOFORM.—A mixture of ethyl chorid 60, methyl chlorid 35, ethyl bromid 5, said to be more rapid in action than ethyl chlorid.

SORBEFACIENTS. (Discutients).—Agents promoting absorption. They may be divided into two classes: (1) those which stimulate the lymphatics to the removal of morbid or inflammatory deposits, (2) those which promote the imbibition of nutritive or medicinal material into the system. (See Alteratives.) These agents include the following: arsenic, mercury, iodin, iodids, cadmium, ichthyol, lanolin, oleic acid, cacao butter, massage, vapor bath, hot water bath, poultices, counter-irritation, galvanism.

SORE THROAT.—See Laryngitis, Pharyngitis, Tonsillitis.

SPANISH FLY.—See Cantharis.

SPARTEIN.—A volatile liquid alkaloid not containing oxygen. It occurs in *Scoparius,* and is a colorless, thick oil, boiling at 311° C. It is narcotic. It stimulates the action of the vagus, and acts more quickly than digitalis, but not so powerfully. It is an uncertain diuretic and cardiac tonic, but is often efficacious when digitalis fails. Dose, of the sulphate, 1/5 grain. See Scoparius.

SPASMS, INFANTILE.—See Convulsions (Infantile).

SPEARMINT.—See Mentha Viridis.

SPECIFIC GRAVITY.—The comparative weight of bodies of equal bulk. It is ascertained by weighing the bodies with an equal bulk of pure water at a given temperature and atmospheric pressure, which is taken as the unit.

To obtain the specific gravity of a body, it is only necessary to balance it with an equal bulk of the standard and to ascertain how many times the weight of the standard is contained in its weight. For example, a fluidounce of water (standard) weighs 455.7 grains; a fluidounce of lime-water weighs 456.3 grains; $456.3 \div 455.7 = 1.0015$: that is, the lime-water weighs 1.0015 times more than water, bulk for bulk. In other words, its specific gravity is 1.0015. A fluidounce of alcohol weighs 422.8 grains; $422.8 \div 455.7 = 0.928$, specific gravity.

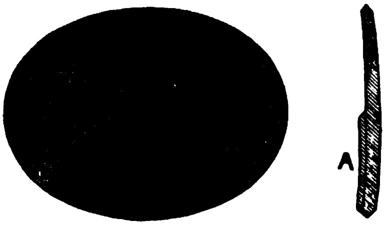
This general rule may be given for finding specific gravity: Divide the weight of the body by the weight of an equal bulk of water; the quotient will be the specific gravity.

SPECIFICS.—Agents which have each a selective curative influence on a particular disease. Mercury is said to be specific to syphilis, quinin to malaria, and other drugs are more or less specific to certain affections, but they have so many actions and uses that they are usually placed in other groups. The true specifics are the various animal extracts and sera, though even these are being found remedial in other than their specific diseases. The most important of these agents are the thyroid and suprarenal glands, and antidiphtheritic serum or diphtheria antitoxin, which are official but many other animal extracts and sera are used in medicine.

SPECTACLES AND EYE-GLASSES.—The fitting of spectacles and eye-glasses is a most necessary adjunct to the art of ophthalmology. Spectacles should always have stout temple-pieces, to maintain their shape and stay in proper position by their weight. To prevent jarring while walking or running, the sidepieces should fit closely to the face and temples; in fact, it is sometimes preferable that they should exert sufficient pressure to slightly groove the skin. By this means a definite and fixed support is given. Fourteen-karat gold is to be preferred, and stout steel should be the second preference. Although silver does not rust, it cannot be made of sufficient rigidity. Delicate wires, either of gold or steel, should not be accepted, as they can only maintain their position by uncomfortable pressure behind the ears and on the nose.

Spectacles are preferable to eye-glasses whenever there is astigmatism, or when the nose is not properly shaped for the ready adjustment of eye-glasses. Hooks are to be preferred to straight temple-pieces when the glasses are to be worn constantly. Reading-glasses are sometimes more convenient with straight side-pieces, particularly in women, on account of the abundance of hair about the temples. For constant use, lenses should be slightly inclined at a compromise angle between the straight position and the inclination preferred for a reading-glass. Of course, the occupation of the patient must be taken into consideration in adjusting the glass. In high defects the glasses should be fitted closely to the eyes, and, if necessary, the lashes should be trimmed from time to time. Glasses should be worn constantly in high defects, in astigmatism, and in all cases in which there are asthenopic or reflex symptoms.

Bifocal glasses are particularly valuable for a presbyope or for a myope of high degree who is compelled to use different glasses for reading and for distance. The improved form, with a reduced curved segment cemented on the distance glass, is far more satisfactory than the old straight Franklin bifocals. The lower segment should be about 2 cm. wide, and the upper edge should be more curved than the lower. If the occupation of the patient subjects him to high degrees of heat or steam, the lower segment should be inserted into a groove in the bottom of the distance glass instead of being cemented on. Although it takes the patients some little time to become accustomed to bifocal glasses, they ultimately give far greater satisfaction, and are more convenient than two different pairs of glasses.



Bifocal Lens.
B. Distance lens. *A.* Reading lens, cemented to the Distance lens.

Before discharging the patient, the adjustment of the glasses should be carefully examined and the correctness of the lenses verified by neutralization. The good effects of many a careful diagnosis of refraction are ruined by maladjusted and decentered glasses.

Tinted glasses of any kind should never be ordered for constant use, but only temporarily prescribed in inflammatory conditions, during mydriasis, for use at the seashore, etc. Once formed, the habit of wearing tinted glasses is difficult to overcome. Photophobia is usually due to uncorrected or improperly corrected ametropia. It is a well-known fact that tinted glasses are most used in countries in which the importance of eye-strain in comparatively low defects is unrecognized. During mydriasis, London smoked plano-lenses should be worn. Coquilles generally have some spheric or cylindric effect on an irregular surface. See Lenses.

SPEECH-DEFECTS.—The importance of speech as a factor in the mental and physical growth of our race is not generally appreciated. Speech has been defined as "a system of articulate words adopted by convention to represent outwardly the internal process of thinking"; but not only does it represent the process of thinking, but it is so closely interwoven with it as to be essential to its highest development. Speech is also one of the essentials to the highest physical development, for its use tends to expand the chest and aerate the blood. The faculty of speech is presided over by delicate and complicated cerebral areas inciting to action and working in harmony with peripheral organs having other important bodily functions in addition to those of voice and speech production. Defective speech, therefore, having its origin in a defective action of some of these important central areas and peripheral organs, is a serious malady, and deserves most careful consideration.

For convenience of study, these defects may be divided into two classes: in the first class are all those cases in which the defect is the chief cause for complaint; and in the second, those in which it is merely a symptom of some more alarming condition: as, for example, cerebral abscess or intracranial pressure, from whatever source.

It is convenient, also, to make two divisions of this class; and of the terms that have been used to designate them, the best are **dyslalia** and **pseudolalia**. Under dyslalia come those forms of defective speech in which there is difficulty of utterance: as, for example, stammering, or stuttering; and under pseudolalia come all those defects that may be characterized as slight deviations from the normal speech, as the slurring or omitting of certain elements and the substitution of one element for another.

Stammering (Dyslalia).

Stammering may be defined as interrupted speech characterized by a spasm of certain opposing muscles more or less closely related to the vocal or oral articulating mechanism. This spasm is not always confined to the muscles directly concerned with speech, but may extend to any part of the body, especially when great effort is made to overcome the interruption. It is never exactly the same in any two cases, nor does it always remain constant either in degree or location, but it changes with the temperament of the individual. The phlegmatic person will sometimes stand and only stare, and use no apparent muscular effort at all until such time as he thinks he may be able to proceed. This has been called the silent form of stammering, and in it there is but little noticeable spasm. In the majority of cases, however, the tendency is at least to try to speak, and the degree and extent of spastic muscular contraction will be proportionate to the strength of the effort put forth.

A muscular spasm, therefore, of greater or less intensity is the one condition that is characteristic of all forms of stammering. The cause of this spasm is manifestly a result of misapplied energy in the effort to speak, and it has its counterpart in the grimaces of the letter-writer unaccustomed to the occupation, and in the muscular contortions of the beginner on a bicycle. To the expert, the control of a pen or a bicycle becomes automatic, and the nervous energy expended is almost *nil;* but to the beginner, the control must be voluntary, and the amount of nervous energy expended is immense and is out of all proportion to that which is required. So in the normal person speech tends to become automatic and to require the least possible amount of nervous energy; but when something happens to interfere with the development of this automatic action of the organs of speech, and voluntary action attempts to come to the rescue, the result is always more or less of a failure. There is a surplus of nervous energy expended, and this surplus overflows, so to speak, into muscles that may have but little to do with the process of speech production—and the result is a spastic contraction, or a spasm of these muscles.

The overflow takes place along the channels of least resistance, which channels vary in different individuals; and, therefore, the spasm does not occur in the same muscles in all cases, nor, indeed, in any two cases. It may occur in almost any part of the muscular system, and its manifestation is often grotesque in the extreme.

Etiology.—The cause of stammering has given rise to much conjecture, and many superficial observers have supposed that they had discovered it, only to be disappointed upon further investigation. The mistake has been made of supposing that there is but one cause for stammering, and that this cause operates alike in all cases. The fact is, there are many causes, as there are many causes for dyspepsia or any other functional disturbance; and the precise cause in any individual can only be determined after a careful and oftentimes prolonged study of the case.

Among the predisposing causes heredity must be placed first. About 35 percent of the reported cases had relatives who stammered. It is an affliction that belongs to youth, and it begins at, or soon after, the time the child begins to talk. It may continue to old age; but stammerers, as a rule, are not long lived. Statistics show that about 84 percent of all cases seeking relief are males, and this would seem to indicate that sex must be regarded as a factor in the cause of the affection.

A nervous temperament, either inherited or acquired, is a condition common to most children who stammer. This condition may follow one of the infectious fevers or other diseases of childhood, or it may be the result of eye-strain, hypertrophied tonsils, adenoid vegetations, or intranasal pressure from whatever source. About 15 percent date the origin of their trouble to a severe nervous shock caused by fright or injury. One child had his head ducked in a tub of cold water and has stammered ever since. Another was threatened with arrest by a policemon for playing "pussy" on the street. He was thrown into a convulsion, and has stammered from that time. A child fell downstairs and received a slight injury, attended by a great nervous shock, and stammering immediately followed.

The various neuroses are more or less prevalent in stammerers and in their ancestors, and therefore they must be regarded as probable predisposing causes. Not only do glandular enlargements in the pharynx and intranasal hypertrophies and spurs act as causal factors in this affection, indirectly and in a reflex manner through the nervous system, but in so far as they interfere directly with the free automatic action of the muscles of vocalization and articulation must they be considered as direct causes. Moreover, we find decided evidences of arrested or imperfect development in the articulating organs of a large percentage of these cases. High and irregular palatal arches are more common than in persons having normal speech; bifid uvula is of frequent occurrence, and we often find abnormalities in the various muscles of the tongue. A very large and imperfectly shaped epiglottis may prove to be the cause in some cases. Anything that interferes with the uniform development and harmonious action of the various mechanisms of speech must be placed among the causal factors of this affection.

Treatment.—Few children would be confirmed stammerers if they could have the proper treatment at the very inception of the trouble. Whatever may be the direct or exciting cause in any particular case, the child begins to hesitate in speech during a period of mental excitement. There is a confusion of ideas that leads naturally to a confusion of words and of the elements of which words are composed. It is here that the turning-point is made. Usually, the child is scolded or ridiculed, either of which procedures tends to add to the confusion and to make future attempts at oral expression still more difficult.

If the little patient can be tided over this period of nervous excitement, in most cases the development of the affection is prevented. Most careful and gentle treatment should be employed. Any attempt at speech should be interdicted until mental quietude is fully established. A careful examination should now be made, with a view to discovering the cause of the trouble, bearing in mind that any condition that may add to the nervous excitability of the patient becomes a contributory cause. Especially must the nose, the nasopharynx, and the throat be examined for obstructions. Careful examination of the mouth should also be made, and so far as possible any irregularities of structure should be corrected and glandular enlargements reduced; the general health of the patient should be put in the best possible condition.

During all this time the child should be encouraged to talk but little, and to think of only one thing at a time, and to express his thoughts with the greatest deliberation. The word "stammering" should never be used in his hearing, nor should his attention be directed in the slightest possible degree toward his speech; for the fear of future trouble in speech is easily aroused, and it is one of the greatest obstacles in all cases to the accomplishment of a cure.

The automatic action of the various mechanisms of speech is no longer possible and the patient is equally incapable of voluntary control of these mechanisms. Manifestly, the object to be attained is the reestablishment of the normal automatic processes of speech, and this can only be done, in a great majority of cases, by making use of voluntary control of the vocalizing and articulating muscles, and thus gradually, but unconsciously, leading the patient back to the normal processes of speech. The first step should be to try to discover the cause, and to remove it if possible. It is well to remember, however, that the original cause may have long since ceased to exist, and that only the results may remain. The stammering, for instance, may be the result of a nervous shock received years ago, or of an adenoid growth long since removed; so that the exciting cause of the trouble may not be apparent at the time of the examination. If, however, we can find any condition that may impair the harmonious action of the nervous system, our attention should be directed toward its improvement.

The general health of the patient, his diet and methods of life, should be carefully investigated and regulated in the minutest detail. The organs of articulation and vocalization should be carefully examined, and an attempt made to correct any abnormality, however slight it may be. A short lingual frenum interfering with the normal action of the tongue is often a great hindrance to freedom of speech, and we frequently find an abnormal development in the various muscles of the tongue; and whether it is the cause or the result of stammering, a slight surgical operation, followed by carefully chosen exercises, will assist very materially toward accomplishing the desired result. Irregularities in the structure of the palate are common in these cases. There is great lack of uniformity in the size and shape of the palatal half-arches. This is probably due in a great measure to adhesions that form between the folds of the palate and the tonsil, thus causing these folds to be irregularly bound down to the tonsil and interfering with their normal action in speech. The condition is easily corrected by the separation of the adhesions and a slight cauterization of the cut surfaces of the tonsil, to prevent the formation of new adhesions. The vault of the pharynx must be examined, and catarrhal conditions treated on general surgical and therapeutic principles. Nasal stenosis, while it may not be a common cause for stammering, undoubtedly serves as an obstruction to its cure, both by its interference with normal respiration and its reflex influence on the nervous system. Intranasal pressure, therefore, should be removed by surgical procedures, if necessary.

Having corrected the patient's habits of life, both dietary and moral, and having removed, so far as possible, all other sources of nervous excitability and physical and mental depression; and having put the peripheral organs of speech in the most favorable condition for normal action, the after-treatment should consist in the development of a perfect voluntary control of certain important muscles employed in respiration, vocalization, and articulation; and this, as has been suggested, should be used as a means—and in the majority of cases it is the only means—for the reestablishment of the normal automatic muscular action.

Unfortunately, many stammerers are deficient in will power, and in these cases a voluntary control is difficult to acquire. They not only do not control their speech, but, to use an expression that is common among them, they "stammer in other things" as well. They do not think connectedly nor do they pursue any line of action to its logical conclusion. These are the cases that are difficult to cure, although they are by no means hopeless. The faculty of the will may be developed by training, just as any other faculty of the mind may be developed; and there are no exercises so efficient for this purpose as those required for the improvement and development of speech.

To gain voluntary control over the organs of speech, certain important muscles that have been considered hitherto as involuntary must be brought under the domination of the will. These muscles belong for the most part to the vocal and respiratory mechanisms. The management of the breath, which is the motor power of the vocal mechanism, is deficient in all cases of stammering, and it is to this point that attention should first be directed.

There is a certain definite and precise action of the great muscles about the lower thoracic and abdominal regions that is necessary to the production and control of voice, and that must be acquired by the patient before any real progress can be made or permanent improvement can take place. Just what the precise action of each one of these muscles is has been the subject of much discussion, and its importance in connection with this work cannot be overestimated. This action is exceedingly complicated, and cannot well be explained within the limits of this article and without a subject for demonstration.

The respiratory muscles must be so used as to bring just sufficient breath upon the vocal cords, and no more than is sufficient, to produce the syllable or word that is required. Not only so, but this little blast of breath must come at exactly the proper instant for the production of the sound. A lack of promptitude at this point is observed in many cases. The voice, of which speech is made, is not present or forthcoming at the instant that the oral mechanism requires it for articulation. The articulating organs try to perform their function, but there is no voice present to be articulated, and the result is a more or less spasmodic hesitancy. The patient dwells upon the initial consonant or repeats it until such time as the vocal mechanism may come to the rescue with the vocal element that is necessary for the completion of the syllable or word.

In other cases it is the oral mechanism that is at fault, and the patient dwells upon the vocal element or repeats it until such time as the articulating organs may be brought into action for the formation of the syllable or word. Suitable exercises must be given to make the action of these two mechanisms entirely harmonious, and this can be done by teaching the voluntary control of the various muscles of that mechanism in which the action is delayed, and then practising this voluntary control daily until the necessary promptitude of action is acquired.

In most cases it is necessary, for the exercise of this voluntary control, to have the patient speak in syllables. Alexander Graham Bell has said that syllabification is the cure for all vocal and oratoric defects. Of course, this is claiming too much for the exercise, but it certainly should have a prominent place in the treatment of stammering. In many cases it is necessary even to divide the syllables into their component parts and to drill the patient on these individual elements. Then, after a certain time, the elements that unite to form each syllable should be practised together and syllabic conversational exercises given, with careful attention to voluntary control over the important respiratory and vocalizing muscles.

In all these exercises there should be an attempt to harmonize the various faculties of the mind, not only with one another but with the exercises themselves. The patient should be induced to think introspectively and to study the impressions that the proper muscular action in the production of each syllable makes upon the mental and physical organisms. Not only should he be conscious through his sense of hearing that the syllable is accurately given, but he should be taught to recognize, by means of the sense of feeling, the physical impressions made by the normal action of the muscles and the resultant vocalization.

The stammerer generally knows how the syllable would sound if properly given, but he has no definite knowledge of how it would feel to give it or what would be the physical and mental impressions. In other words, the mental and physical sensations of speech should be studied and developed in what has been called the kinesthetic center of the brain; and after these sensations are recognized and felt, the patient should be taught to reproduce them.

Pseudolalia.

In this division may be conveniently placed all those defects of speech in which there is no spasmodic hesitation. The chief characteristic of this form would be a defective or false utterance of certain syllables or words. In some cases there is a substitution of one element for another. In others there may be an entire omission of the element. In one case that has been reported there was a complete substitution of a language entirely unknown for that which the patient attempted to use; and not a single element of this false language had any resemblance to the element for which it was substituted.

This, however, is unusual, and the majority of these cases give proper utterance to at least one of the elements and thus suggest the syllable or word intended to be spoken. The first element in a word is sometimes omitted, and, as some one has said, the word becomes "decapitated." More often, however, the final consonant is not given, and the word becomes "decaudated"; and when all the elements are mispronounced, the word may be said to be "mutilated." This mutilated speech is characteristic of imbeciles and idiots and all those having a cerebral lesion. That there is some defective cerebration in all these cases must be admitted.

Nice distinctions are not made in the utterance of the various elements of which words are composed. The auditory word center in the brain fails to recognize or to register accurately the exact sound produced by the peripheral organs of speech. No distinction may be made, for instance, in the physiologic sounds of the consonants *D* and *G* or *T* and *K;* the one being substituted for the other without any conscious recognition of the substitution, or one of these consonants may be omitted entirely and the ear fails to recognize the omission.

Other cerebral areas may be similarly deficient in the performance of their natural functions, or, as is often the case, this auditory center is the only one affected. It must be remembered also that normal cerebral development depends very largely upon the use of the faculty of speech, and therefore that defective mentality which at first glance may seem to be the cause, may in reality be the result, of defective speech.

Pseudolalia, like dyslalia, often has its origin in abnormalities in the structure of the peripheral organs of speech. The slightest irregularity in the organs of articulation may be responsible for the development of mutilated speech in children. It may be said that anything that interferes with the normal action of the articulating organs may result in serious defects of speech. The shape of the hard palate, the dental arch, and the condition of the teeth all affect the character of the speech. A short lingual frenum or any deformity of the lingual muscles not only causes defective speech, but may make speech so disagreeable as to greatly delay its development and thus interfere with the child's mentality. Enlarged faucial tonsils and adenoid vegetations in the vault of the pharynx have long been supposed to interfere in some mysterious way with the mental development of children; but they probably interfere with mental development only so far as they impair the patient's physical condition and obstruct the development of normal speech.

Another common cause of these defects of speech is the paralysis that often follows diphtheria and the various infectious fevers prevalent in children. This paralysis may be of only short duration, and yet if it come during the formative speech period, it is sure to leave its deleterious influence. It is during the earlier years of adolescence that these irregularities in the peripheral organs of speech do harm; and although they may disappear altogether after a few years, as is sometimes the case with hypertrophied tonsils, or they may be removed by surgical interference later in life, yet the defects of speech of which they were the direct cause remain as fixed physical habits until they are corrected by suitable training.

This is well illustrated by those cases having cleft palate. If the operation for the closure of the cleft is delayed until after the formative speech period and until that peculiar speech characteristic of cleft palate is fully established, it will have little or no effect upon the speech, however well the deformity may be corrected. This fact would seem to indicate that it is not so much the cleft palate that causes the defective speech, as the abnormal muscular action that is the direct result of the cleft palate. However that may be, this abnormal muscular action must be corrected after the two halves of the palate are put in apposition if improvement in speech is to be effected.

Treatment.—In discussing the treatment of stammering it was found that the object to be attained was the correction of a faulty coordination between the vocal and the oral articulating mechanisms, and indirectly, perhaps, between the muscles within one or the other of these two mechanisms. In pseudolalia the lack of coordination is entirely within the oral articulating mechanism. There is a faulty action in some of the muscles of the lips, the tongue, or the palate; and whatever may be the cause of this faulty muscular coordination, there is always a corresponding defective action in the nerve centers that preside over these mechanisms.

A careful physical examination of the patient must first be made, with a view to determining the cause of the defect, always keeping in mind that this cause may have existed only in the past and during the formative speech period. All structural peculiarities of the articulating organs should be carefully noted, and any obstructive irregularities corrected or removed. When this is accomplished, muscle training should be given, with a view to correcting the faulty action and establishing correct coordination. A lack of uniformity is often found in the development of these muscles, and this condition may be corrected by suitable voluntary exercises entirely independent of speech. For instance, muscles of the lips or of the tongue that have been entirely involuntary may be brought under control of the will and made to act independently of others, and thus be trained to perform their natural functions. This muscle training is an important factor in all speech defects, not only on account of its value in harmonizing the action of the muscles themselves, but also on account of the fact that it serves as a direct stimulus to the development of the cerebral areas that preside over the muscles, and the general mental development resulting from these exercises is sometimes very marked.

Exercises for the correction of the special defects that may exist in each individual case should follow this muscle training. Speech is voice articulated or molded into certain definite shapes or forms. The vocal mechanism furnishes the voice, and the oral articulating mechanism the molds into which the voice may be regarded as being poured. Each syllable of speech requires a separate and distinct adjustment of the articulating organs, and those syllables that are composed of two or more primary elements require for and during their utterance certain variations in the molds. For instance, the syllable "*m-a-t*" has in it three primary elements, for each of which a separate mold is required; but in the utterance of this syllable these elements follow one another in quick succession and close sequence, and therefore these primary elements must be made to follow one another so closely as to form what is practically one variable mold, upon the structure and formation of which depends the character of the resultant speech.

If any part of this mold is imperfect in its formation, there will be corresponding defect in the articulation of the syllable. For instance, if the first primary mold required for the physiologic sound represented by "*m*" is omitted, the syllable will be "decapitated"; and if the last sound represented by the letter "*t*" is omitted, it will be "decaudated," and if the three primary molds are improperly formed and coordinated, the syllable will be "mutilated."

The decapitation, decaudation, and mutilation of syllables are phenomena designated pseudolalia, and in the treatment of this affection the proper formation and coordination of the primary molds of speech and their coordination into what have been called the variable molds required for the utterance of syllables and words must be taught. To do this one must have an accurate knowledge of the anatomy and physiology of the organs of speech, and the location of each muscle; and he must be able to form a clear mental picture of the exact position of the organs of articulation required for the formation of the primary molds for the elements of speech and their coordination into the variable molds for the syllables and words.

The patient must be taught the precise voluntary muscular action required for the formation of these molds. He must be shown, for instance, how to shape the lips and where to place the tongue for each element of speech in which he may be found deficient; and thus, by frequent repetition of this voluntary control of the organs of speech, he may be trained to speak automatically with great accuracy.

It will be observed, therefore, that the principle underlying the treatment of all defects of speech consists in the establishment of an accurate voluntary muscular control of the organs, this control to be continued until the faulty processes or habits of speech have been entirely eradicated, and the new and improved methods become habitual and automatic. See APHASIA.

SPERMATIC CORD, DISEASES.—**Torsion of the spermatic cord**—*i. e.*, a twisting of the cord so that the epididymis is felt in front instead of behind the body of the testis—is occasionally met either in a testis to all external appearance previously normal, or in a testis retained in the inguinal canal. The twisting has been attributed to spasm of the cremaster. If unrelieved, the testicle will atrophy or necrose.

Symptoms.—The torsion is attended by a tender and painful swelling in the groin or scrotum, dull on percussion, irreducible, and without impulse on cough, the symptoms generally coming on suddenly after great strain or exertion. Vomiting is nearly always present, and there may be constipation. Thus, when the testis is retained, a strangulated hernia is very closely simulated.

Treatment.—When seen early, the cord may be readily untwisted if the testis is in the scrotum, the symptoms at once disappearing. If the testis is in the groin or inguinal canal, it should be removed and the canal and ring closed by sutures.

See also Hematocele, Hydrocele, Testicle, Varicocele.

SPERMATOCELE.—See Hydrocele.

SPERMATORRHEA.—See Nocturnal Emissions.

SPERMATOZOA.—See Seminal Stains.

SPERMIN.—Spermin has been found in the form of a phosphate in the thyroid and thymus glands, the spleen, the ovaries and the blood, as well as in the testes. Poehl believes it to be an alkaloidal product of the retrogressive metamorphosis of albumins (a leukomaïn), and a most powerful intraorganic restorative of the oxidizing properties of the blood. He states that it should not be regarded as a specific for any particular malady, but should be used as a means of promoting oxidation in the body. It has been employed with decided benefit in ataxia and delirious epilepsy, as a tonic in tuberculosis also in senile marasmus and the nervous affections of the aged. The hydrochlorate is used hypodermically, in doses of 1/8 grain twice daily, in the morning and at noon, avoiding evening administration, as it may cause insomnia. No reaction follows its injection.

SPHACELODERMA (**Dermatitis Gangrenosa, Spontaneous Gangrene of the Skin**).—See Dermatitis Gangrenosa Infantum, Raynaud's Disease.

SPHENOIDAL SINUSES, DISEASES.—See Nose (Accessory Sinuses).

SPHYGMOGRAPH.—See Pulse.

SPIDER-BITE.—See Bites and Stings.

SPIGELIA (**Pinkroot**).—The dried rhizome and roots of *S. marilandica*. A popular vermifuge, generally adminstered with senna. Should be employed with the usual precautions as to feedings, and a purge should be administered while the worm is narcotized, to carry it out of the bowel. In large doses it is an uncertain cathartic. Poisoning is manifested by palsy of spinal origin, the respirations becoming slow as death approaches, and finally ceasing simultaneously with the action of the heart. Vertigo, dimness of vision, dilated pupils, dyspnea, convulsions, and spasms are lesser phenomena. Dose, 30 grains to 2 drams. **S., Flext.** Dose, for a child, 10 to 20 minims; for an adult, 1/2 to 2 drams. **S., Infus., Comp.,** "worm tea," "pink and senna," unof.; spigelia 15, senna, fennel, each 10, manna 30, water 500. Dose, 1 1/2 to 5 ounces.

SPINA BIFIDA. (**Hydrorrhachis**).—A congenital deficiency in the bony covering of the spinal cord, or failure of the spinal laminæ to unite, present in about one in every 1000 births. Sometimes there is a small congenital gap in the spine, the cord and membranes remaining in the canal (*spina bifida occulta*); the skin is frequently indented over this defect and the dimple filled with hair. These cases need no treatment unless there are symptoms of pressure on the cord, when the removal of such compression, which may be due to hypertrophy of the skin and subjacent soft parts, would be indicated. In 2 percent of the cases the cleft is wide, the skin is absent, and the cord protrudes through the opening, its central canal communicating with the surface of the body (*myelocele*). This condition is not compatible with existence. In 10 percent the membranes alone escape through the opening (*meningocele*), but in the vast majority (about 75 percent) there is also a portion of the cord in the protuberance (*meningomyelocele*), and very rarely the tumor is the result of a dilatation of the central canal of the cord (*syringomyelocele*). The last variety is often situated laterally. More than one vertebra is usually fissured, and cases have been reported in which all the vertebræ were involved. Rarely the body of the vertebra is implicated (*anterior spina bifida*). One-half of all cases occur in the lumbar region and more than one-third in the lumbosacral or sacral portion of the spine. (Stewart).

The coverings of the sac may be healthy skin, but more commonly normal skin is only found at the sides, the central portion consisting of a thin bluish membrane. Sometimes a slight depression is seen on the lower part of the sac at the spot where the cord terminates in the wall. This is called the umbilicus, and at its bottom the central canal of the cord has at times been seen to open. In some instances there is no protrusion, but rather a depression in the situation of the cleft between the vertebræ (*spina bifida occulta*) the cleft being occupied by the blended membranes, cord, and skin, and the spot covered with a tuft of hair. In obscure paraplegias, contractures, and deformities of the feet the back should be examined, since this condition may be present but has been overlooked by the mother.

Symptoms.—The swelling is usually of a globular or oval shape, translucent, sessile or slightly pedunculated, and flaccid, but becomes tense and distended on coughing or crying. Pressing upon it sometimes causes the fontanels to swell up, and may produce convulsions. When the spinal cord and large nerves are involved, there may be paralysis of the extremities or of the bladder or rectum. The gap between the laminæ of the vertebræ may at times be felt on pressing on the sac. As a rule, these tumors show a great tendency to enlarge, and rupture spontaneously, in which case death usually follows from the draining away of the cerebrospinal fluid and septic meningitis. Death, however, is sometimes due to marasmus and defective nutrition. When a spontaneous cure takes place, it is usually due to the gradual shrinking of the sac.

Diagnosis.—Its congenital origin will at once distinguish a spina bifida from a new growth developed subsequently to birth; and its situation in the middle line, translucency, increase of tension on straining, and the gap between the laminæ, when this can be felt, will usually serve to diagnose it from other congenital tumors.

Treatment.—As there are no means of accurately determining that the spinal cord is not in the sac, it has hitherto not been considered safe to attempt excision or ligation, although these operations have at times been attended with success. Repeated tappings are very fatal. The treatment usually employed, except when the spina bifida is very small or is apparently undergoing a spontaneous cure, when it should be left alone, is to inject the sac with Morton's iodoglycerin fluid. This method when successful causes the tumor to shrink, and most closely follows the process of nature when a spontaneous cure occurs. The injection is best performed when the child is two months old; but it may be done earlier if the sac threatens to burst. The best results may be expected when there is no hydrocephalus or paralysis, and the sac is covered by healthy skin. It is contraindicated when there is advanced marasmus, great and increasing hydrocephalus, and intercurrent disease. The child should be placed on its side, and the puncture made obliquely through healthy skin on one side, and the base of the tumor, and not through the thin and imperfectly formed skin, which nearly always covers the sac in the middle line, the object being to avoid wounding the expanded spinal cord, and the subsequent leakage of the cerebrospinal fluid. About a dram of the iodoglycerin fluid (iodin (10 grains), iodid of potassium (30 grains), glycerin (1 ounce)) should be injected, and the injection repeated in a fortnight if the first trial is not successful. The fluid contained in the sac should not be drawn off before the injection. The advantage of Morton's fluid over tincture of iodin alone is that, owing to the glycerin it contains, it becomes uniformly diffused over the sac-walls. The injection of iodoglycerin is not unattended with danger; therefore, when the sac is small and its walls are thick and it is not increasing in size, beyond protecting it with a metal or leather shield, no further treatment should be attempted. Mayo Robson advocates excision in all cases except when there is well-marked paraplegia, hydrocephalus, or marasmus, or when the tumor is small and well covered by a firm pad of integument. In spinal meningocele he makes skin flaps, removes the sac, ligates or sutures the base, and brings the flaps together by suture. In meningomyelocele he separates the skin from the sac, opens and dissects out the sac, taking care that the lines of suture in the meninges and skin are not opposite.

SPINAL CORD, ANESTHESIA.—See INTRASPINAL ANESTHESIA.

SPINAL CORD, DISEASES.—These are considered under their special headings. See AMYOTROPHIC LATERAL SCLEROSIS, CAISSON DISEASE, FRIEDREICH'S ATAXIA, LOCOMOTOR ATAXIA, MUSCLES (Progressive Atrophy, Progressive Dystrophy), MYELITIS, PARALYSIS (Acute Ascending, Bulbar, Infantile), PARAPLEGIA, LATERAL SCLEROSIS, SYRINGOMYELIA, etc.

SPINAL CORD, INFLAMMATION.—See MYELITIS.

SPINAL CORD, INJURIES. Contusion of the Spinal Cord (Hematomyelia).—Hemorrhage into the substance of the cord is nearly always the result of forced flexion, and occurs naturally in the region in which fracture by indirect violence is most common. Sometimes the similarity of origin is shown by their occurrence together, but independently of each other. It is possible, however, that it may be caused by direct violence. The hemorrhage nearly always lies in the gray substance of the cord, because this is the softest and the most vascular part, and it may occupy an indefinite length. The effect is immediate, becoming intensified later, as the hemorrhage extends. Motion and sensation are lost over a corresponding area; reflex action is suspended for a time, but rarely as completely as when the cord is crushed; and then later, as the circulation around the injured area becomes more active, hyperesthesia sets in; motor disturbances are rare. The subsequent course depends chiefly upon the degree of the primary injury. The extravasated blood may be in great measure absorbed, leaving a certain degree of anesthesia, with paralysis or spastic rigidity of the muscles corresponding to the part of the cord that has been destroyed; or, on the other hand, red softening and ascending myelitis may follow, the paralysis extend higher, bed-sores and cystitis set in, and, if the injury is in the cervical region, phenomenal temperatures, just as when there is a fracture.

Wounds of the spinal cord are rare in civil practice, but they may be produced by stabs, the weapon passing between the arches of the vertebræ, possibly notching or incising them as it does so; or by gunshot injuries. The symptoms in either case depend upon the seat and the extent of the injury, and only differ from those of crushing of the spinal cord in fractures by their proneness to inflammation and suppuration.

Compression.—This is much more rare; it may be caused by a lamina driven in, though when this occurs the delicate nervous tissue is almost sure to be utterly crushed; or by hemorrhage, either inside the theca or between it and the bones (it is impossible to distinguish one from the other); or later it may result from inflammation, as in Pott's disease. If due to bone, the symptoms are immediate; if to hemorrhage, there is a distinct interval before they commence, and they progress from below upward, affecting the leg first, and then the trunk, until the respiratory muscles are involved. The loss of motion is more marked than that of sensation, but it is rarely so definite as in contusion; pain along the course of the nerves, hyperesthesia extending around the trunk, and muscular tremors are more frequent. In many instances the blood is absorbed again and the symptoms subside; occasionally it accumulates to such an extent as to prove fatal, either from its pressure or from secondary softening and degeneration. See SPINE (Diseases, Injuries).

Concussion.—This injury occurs practically under the same conditions as contusion, and can only be distinguished from it by the symptoms being general, not confined to any one portion of the spinal cord, and by their passing off within a few hours. Afterward, when the immediate symptoms have disappeared, hyperemia may set in, as in concussion of the brain. If there is no contusion, as very rarely happens, this may be merely transient, and under proper treatment subside without leaving behind any serious result; but if the part is not kept at rest, or if there is severe contusion, it may increase, and either run to inflammation or lead to softening and degeneration.

Railway Spine.—Railway accidents are not infrequently followed by a peculiar train of symptoms, which have been grouped together under the name "railway spine," justly stigmatized by Page as absurd. The symptoms do not set in immediately and are not those of any gross lesion of the cord, such as contusion or inflammation. As a rule, they do not appear for 3 or 4 days; then, after lasting some time, they either begin to subside or steadily grow worse. The chief difficulty is to distinguish them from locomotor ataxia and chronic meningomyelitis, both of which may undoubtedly follow injuries to the back. If, however, sufficient attention is paid to objective symptoms, to the distribution of areas of anesthesia, for example, and the electric reactions of muscles, it can usually be surmounted. Railway accidents are always accompanied by an extreme degree of shock that occasionally, but fortunately not very often, grows worse and worse; the patient becomes more feeble, and without being able to assign any definite reason for it, or find any gross lesion, death ensues after a few weeks or months, just as sometimes happens after a severe mental shock. More frequently there is a certain amount of improvement for a time, but not perfect recovery. The extreme depression passes off, but the patient remains weak and feeble, unable to control himself or to exercise deliberate judgment, with mental capacity and bodily vigor alike impaired. The symptoms are of the most varied character. Some, such as palpitation, flushing, alternate sensation of heat and cold, and menorrhagia, may be accounted for by the disordered working of the vasomotor system; others, like sleeplessness, dreaming, headache (often posterior), irritability of temper, emotional display, noises in the ears, and failure of sight, are due to interference with the blood supply of the brain and the organs of special sense. The bodily strength fails; gastrointestinal disturbances are present; the patient becomes worn and emaciated; the cerebral symptoms grow more pronounced, and at last he becomes utterly broken down in health, feeble in mind as well as body, and aged before his time. This history is not in any way peculiar to railway accidents. It may be induced by injuries of all kinds, especially in those who from heredity or for other reasons are in any way predisposed to the occurrence of nervous disorders. It is not uncommon, for example, after severe and prolonged mental worry; it may even follow a single shock, as noted by Moullin.

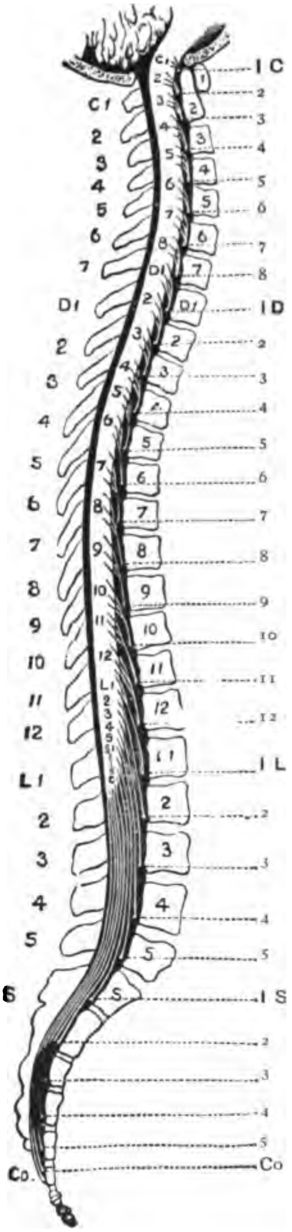
In another class the symptoms resemble those ordinarily grouped together as hysteric. There may be epileptiform attacks from time to time, with insanity, melancholia, or suicidal impulse. Anesthesia and hyperesthesia may occur, affecting the special nerves as well as those of ordinary sensation. In other instances muscular paralysis, affecting physiologic groups rather than anatomic ones, or spasmodic contraction is present, the electric reaction remaining unaltered. Retention of urine and aphonia are very common; and numerous other symptoms are met from time to time—pains in the joints, for example, of the most excruciating character, without any objective sign, dysphagia, torticollis, closure of the jaws, etc.

If in any of these groups of cases there is, in addition, a severe sprain of the muscles or ligaments of the neck and back, so that every movement is attended with pain, the difficulty of proving that the injury is limited to external structures, and that the spinal cord is not involved as well, may be imagined. The local symptoms, the stiffness, rigidity, and pain, grow worse and worse as time goes on. If the hypnotic state continues, each suggests some further trouble, and it is almost impossible to distinguish between the real and the functional disorder. The desire to recover is often not genuine, even when it is present, and it is impossible to obtain any assistance from the patient. If there is even a suspicion of chronic inflammation of the spinal cord, it is a serious matter to propose active measures. Time is thus wasted, and the muscles become more rigid from disuse; the extravasated blood becomes organized; adhesions are formed in all directions; and it ends in leaving a permanently crippled condition.

The diagnosis from chronic inflammation of the spinal cord rests chiefly upon the absence of definite local signs. Stiffness and rigidity of the back are not leading characteristics of chronic meningitis. When this sets in, there are other symptoms, usually of an unmistakable character: There is pain along the course of certain nerves; or anesthesia and hyperesthesia of definite regions; special groups of muscles are wasted or paralyzed; the electric reactions are abnormal; the cutaneous reflexes are enfeebled or lost; in short, there is definite evidence of injury to nerves or centers in the cord, such as does not occur in sprains of the veretebral column alone, however severe the mental depression and bodily weakness may be (Moullin).

SPINAL CORD, LOCALIZATION.—The following table (after Starr) shows the location of function in the different segments of the spinal cord:

SEGMENT.	MUSCLES.	REFLEX.	SENSATION.
Second and third cervical.	Sternomastoid; trapezius; scaleni and neck; diaphragm.	Hypochondrium (?). Sudden inspiration induced by sudden pressure beneath the lower border of ribs.	Back of the head to the vertex. The neck.
Fourth cervical	Diaphragm; deltoid; biceps; coracobrachialis; supinator longus; rhomboid; supraspinatus and infraspinatus.	Pupil. Fourth to seventh cervical. Dilatation of the pupil induced by irritation of neck.	The neck, upper part of the shoulder, and outer part of the arm.
Fifth cervical	Deltoid; biceps; coracobrachialis; supinator longus; supinator brevis; rhomboid; teres minor; pectoralis (clavicular part); serratus magnus.	Scapular. Fifth cervical to first dorsal. Irritation of skin over the scapula induces contraction of the scapular muscles. Supinator longus. Tapping its tendon at wrist induces flexion of forearm.	Back of the shoulder and arm. Outer side of the arm and forearm, front and back.
Sixth cervical	Biceps; brachialis anticus; pectoralis (clavicular part); serratus magnus; triceps; extensors of wrist and fingers; pronators.	Triceps. Sixth to seventh cervical. Tapping elbow tendon induces extension of forearm. Posterior wrist. Sixth to eight cervical. Tapping tendons causes extension of hand.	Outer side of the forearm, front and back. Outer half of the hand.
Seventh cervical	Triceps (long head); extensors of wrist and fingers; pronators of wrist; flexors of wrist; subscapular; pectoralis (costal part); latissimus dorsi; teres major.	Anterior wrist. Tapping anterior tendons causes flexion of wrist. Palmar. Seventh cervical to first dorsal. Stroking palm causes closure of fingers.	Inner side and back of arm and forearm. Radial half of the hand
Eight cervical	Flexors of wrist and fingers; intrinsic muscles of hand.		Forearm and hand, inner half.
First thoracic	Extensors of thumb; intrinsic hand muscles; thenar and hypothenar eminences.		Forearm, inner half. Ulnar distribution to the hand.
Second to twelfth thoracic.	Muscles of back and abdomen; erectores spinæ.	Epigastric. Fourth to seventh thoracic. Tickling mammary region causes retraction of the epigastrium. Abdominal. Seventh to eleventh thoracic. Stroking side of abdomen causes retraction of belly.	Skin of chest and abdomen, in bands running around and downward, corresponding to spinal nerve. Upper gluteal region.
First lumbar	Iliopsoas; sartorius; muscles of abdomen.	Cremasteric. First to third lumbar. Stroking inner thigh causes retraction of scrotum.	Skin over the groin and front of the scrotum.
Second lumbar	Iliopsoas; sartorius; flexors of knee (Remak); quadriceps femoris.	Patella tendon. Striking tendon causes extension of leg.	Outer side of the thigh
Third lumbar	Quadriceps femoris; inner rotators of thigh; abductors of thigh.		Front and inner side of the thigh.
Fourth lumbar	Abductors of thigh; adductors of thigh; flexors of knee (Ferrier); tibialis anticus.	Gluteal. Fourth to fifth lumbar. Stroking buttock causes dimpling in fold of buttock.	Inner side of thigh and leg, to the ankle. Inner side of the foot.
Fifth lumbar	Outward rotators of thigh; flexors of knee (Ferrier); flexors of ankle; extensors of toes.		Back of the thigh and leg, and outer part of the foot.
First to second sacral.	Flexors of ankle; long flexors of toes; peronei; intrinsic muscles of foot; perineal muscles.	Plantar. Tickling sole of foot causes flexion of toes and retraction of leg. Foot-reflex. Achilles tendon. Overextension of foot causes rapid flexion; ankle-clonus. Bladder and rectal centers.	Back of thigh. Leg and foot, outer side. Skin over sacrum. Anus. Perineum. Genitals.



MOTOR.	SENSORY.	REFLEX.
Sternomastoid. Trapezius.	Neck and scalp.	
Diaphragm.	Neck and shoulder.	
Serratus Shoulder Arm Hand (ulnar, lowest). musc.	Shoulder. Arm. Hand.	Scapular.
Intercostal muscles.	Front of thorax. Ensiform area.	Epigastric.
Abdominal muscles.	Abdomen. (Umbilicus, 10th). Buttocks, upper part.	Abdominal.
Flexors, hip.	Groin and scrotum (front).	Cremasteric.
Extensors, knee. Adductors. hip.	Thigh outer side. front. inner side.	Knee-joint.
Abductors hip.	Leg, inner side. Buttocks, lower part.	Gluteal.
Extensors (?). Flexors, knee (?). Muscles of leg moving foot.	Back of thigh. Leg and foot except inner part.	Foot-clonus. Plantar.
Perineal and anal muscles.	Perineum and anus.	
	Skin from coccyx to anus.	

DIAGRAM AND TABLE SHOWING THE APPROXIMATE RELATION TO THE SPINAL NERVES OF THE VARIOUS MOTOR, SENSORY, AND REFLEX FUNCTIONS OF THE SPINAL CORD. (*Arranged by W. R. Gowers, from anatomic and pathologic data.*)

SPINAL CORD, TUMORS.—The diagnosis of tumors of the cord and its membranes necessitates a knowledge of the symptoms of tumors involving the spinal column. It, therefore, seems appropriate to consider tumors of all these structures under the same general heading.

Tumors of the Spinal Column.—Tumors of the spine resulting from spina bifida and other congenital tumors are discussed under their various heads.

Etiology.—Tumors of the spine are exceedingly rare before the thirtieth year. They are not frequent at any time of life, but are found most commonly during the fifth decade. They occur with slightly greater frequency in the male than in the female. Injury to the spine is undoubtedly the exciting cause in some instances.

Pathologic Anatomy.—Carcinoma—either of the scirrhous or encephaloid variety—osteosarcoma, and sarcoma are the most frequent growths of the spine. Tumors of the spine may be primary or secondary. Cancerous growths of this region may be secondary, especially when the primary lesion is in the breasts, stomach, or mediastinum. According to Gowers and others, primary growths are more likely to begin in the bodies of the vertebræ. If the bodies of the vertebræ are weakened by the neoplasm, angular curvature of the spine may take place, as in caries. The spinal nerves may suffer by compression, inflammation, or infiltration (Gowers). The spinal cord is rarely, if ever, infiltrated; but it is often compressed by the growth extending into the spinal canal. In nearly all advanced cases the cord is inflamed opposite the seat of the growth.

Symptoms.—These result from involvement of bone, the spinal nerves—which rarely ever escape—and from compression and inflammation of the cord. The latter may appear early or not until late in the course of the disease. The bone symptoms differ from those of caries in that among the former there may be a discoverable tumor, especially in the cervical region, and a greater severity of the spinal pain, well pronounced on bending the spine in different directions.

The nerve-root symptoms, especially pain, which is usually an early symptom, are often pronounced. Radiating pains and areas of hyperesthesia and anesthesia are frequently more marked than in caries or in tumors of the membranes. The cord symptoms are those of myelitis. In some instances complete paralysis takes place within a few days or a few weeks after the first cord symptoms appear.

Diagnosis.—The diseases likely to be confounded are caries and tumor, after the symptoms point unmistakably to organic disease of the spine. The presence of a tumor, when this can be felt, a primary growth in some other portion of the body, the severity of the pain, both bone and nerve-root, and in cases of cancer the rapid progress of the disease, are points in favor of a tumor.

Duration and Prognosis.—Carcinoma of the spine runs a rapid course, and results in death in a few months. Life is rarely prolonged a year. Slowly growing tumors may run a course of one to several years. Gowers quotes a case that lasted 13 years, death finally taking place from meningeal hemorrhage. Death usually takes place from myelitis. Unless the tumor is so situated that it may be removed, which is, unfortunately, rarely the case, death invariably results.

Treatment.—In inoperable tumors of the spine the treatment resolves itself into prolonging life by giving nourishing food, and in making the patient as comfortable as possible by the judicious use of various anodynes and analgesics, of which, unfortunately, morphin is our main reliance. In cases in which the pains are not too severe, the following formula has postponed the use of morphin until late in the disease:

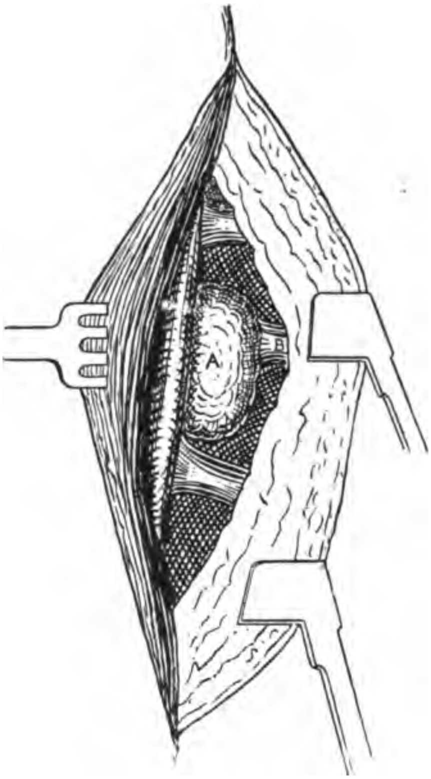
℞.	Extract of cannabis indica,	gr. 1/6
	Sulphate of codein,	gr. j
	Phenacetin or acetanilid,	gr. iij
	Citrated caffein,	gr. ij.

In capsule, and repeated only as often as it is absolutely necessary for the relief of pain.

Codein is much less objectionable than morphin in those cases in which the pain can be relieved by it.

Tumors of the Cord and of its Membranes.

The symptoms of tumors of the cord are so similar to those of the membranes that it will be more convenient to study these together; and in the section on diagnosis to endeavor to bring out the differential points between an unmistakable case of tumor of the cord and one of the membranes. In many cases, especially when the neurologist is consulted, it is only possible from the symptoms present to make a diagnosis of intraspinal tumor, irrespective of the primary seat of the lesion. In others, however, by a careful study of the history, with especial reference to the initial symptoms and to the manner of development of additional ones, and by thorough, repeated, and systematic examinations, a fairly definite diagnosis can be made between tumor of the cord and of the membranes. Theoretically, the symptoms of tumor in the substance of the cord are such as denote destruction of tissue and abolition of function; while those that result from a growth in the membranes are such as one would expect from irritation of tissue—perversion of function. Practically, however, the early symptoms of tumor of the cord may be irritative in character, and in the



Showing the Relation of the Tumor to the Cord which it had Displaced to the Left.—(*Eskridge.*)

A. Tumor. *B.* Eroded end of fourth rib. The neoplasm had apparently taken its origin on the anterior surface of the body of the fourth dorsal vertebra and extended into the spinal canal, completely separating the end of the rib from the vertebra.

advanced stages of tumor of the membranes the function of the cord may be totally abolished.

Etiology.—Intraspinal tumors may occur at any time of life. They are most frequent between the fifteenth and the forty-fifth years. In an analysis of 50 cases Mills and Lloyd found 14 percent before the twentieth year. They are slightly more frequent in the male than in the female. Syphilis and tuberculosis are diathetic conditions that may lead to the development of tumors of the cord or of the membranes. Traumatism has been credited with causing many of the intraspinal tumors. Growths here are often secondary to similar ones in other portions of the body. In the majority of cases no real cause can be found.

Pathologic Anatomy.—In the substance of the cord sarcoma and the different varieties of it, especially glioma, are the most frequent tumors met. Solitary tubercles, syphiloma, and a few other growths may take place here. In the membranes fibroma, sarcoma, fibrosarcoma, myxoma, psammoma, tubercle, syphiloma, and several other varieties occur. Neuromata are found on the spinal nerve-roots and the cauda. The dorsal region is the most common seat of tumors. Fibroma is rarely more than an inch or two in length, and its long axis corresponds with that of the spinal canal. The sarcomata and some other growths may be several inches in length, and in rare instances have extended nearly throughout the entire length of the cord or spinal canal. Tumors may arise from the fatty substance between the bone and dura—especially lipoma—from the external or internal surface of the dura, from the soft membranes, or from the substance of the cord itself. In some instances a tumor takes its origin from the soft tissues outside of the spinal canal and grows inward through the intervertebral foramina. Extradural growths have always been found to be single; the intradural ones, while often single, may be multiple. Tumors of the membranes, while usually small, may be limited in size only by the width of the spinal canal; hence tumors of the cauda often attain a larger size than those occurring higher up in the spinal canal. Tumors of the substance of the cord are usually small, and generally begin unilaterally. Growths of the membranes compress the nerve-roots, the cord, and often give rise to meningeal irritation. The growths are usually unilateral, but in some instances they involve the membranes so as completely to encircle the cord.

Symptoms.—The tissues irritated, compressed, or destroyed in intraspinal tumors may vary so much in different cases that the symptoms are rarely the same in any two. A knowledge of the numerous conditions that may exist within the spinal canal, although apparently at first confusing, will often enable one, by a careful analysis of all the symptoms in an individual case and a minute sifting of the details of the history of the disease, to make a fairly accurate diagnosis.

The early symptoms may be from unilateral irritation of the spinal nerve-roots, sensory or motor; from unilateral irritation of the membranes, or of the membranes and nerve roots; from unilateral irritation of nerve-roots, membranes, and cord; from unilateral irritation of the cord alone; from bilateral irritation of the nerves and membranes; from bilateral irritation of the nerves, membranes, and the cord, or from bilateral irritation of the cord alone. The symptoms are more decided in character—both of irritation and destruction—in infiltrating than in noninfiltrating growths. The symptoms vary in character according to the region of the spinal canal in which the tumor is situated; they are modified by the structures in which the tumor takes its origin, especially whether the cord is primarily the seat of the growth or is affected by compression; and finally the rapidity with which the symptoms develop depends upon whether the tumor is slow or rapid in its growth.

The symptoms may be divided into nerve-root, meningeal, and cord symptoms. In tumor of the spinal cord the cord symptoms are usually the primary ones. In rare cases in which the growth is situated in the posterior portion of the cord, usually unilateral and involving the nerve-root fibers from the posterior horn, the early symptoms may be of a nerve-root character. Extramedullary tumors give rise to nerve-root and meningeal symptoms before those of the cord are manifest.

Nerve-root Symptoms.—These are usually unilateral and sensory in character early in the course of the disease. If the cauda is affected, the symptoms are bilateral and affect the legs and feet; if the tumor is in such a position as to involve some of the nerves of the lumbosacral plexus, the pain will be felt in one leg; if the brachial plexus is affected, the pain radiates in one arm; if some of the trunk nerves are the seat of the irritation, the early symptom may be pain at the distal portion of one or two nerves, without pain or tenderness in any other portion of those nerves for a while.

In some cases hyperesthesia throughout the distribution of the affected nerve or nerves is well marked; and later anesthesia replaces the hyperesthesia. In those cases in which the nerve-roots become infiltrated by the growth, wasting of the muscles supplied by the affected nerves takes place, and there may be the reactions of degeneration. These phenomena are especially pronounced in the legs in tumors of the cauda. The skin over the area of distribution of the inflamed or degenerated nerves may show changes, such as herpetic eruptions, glossiness, and thickening. Meningeal irritation is evidenced by pain in the back, tenderness on pressure, and muscular twitching. The pain and tenderness in the back are not nearly so pronounced as they are in tumor of the vertebræ, nor are movements of the spine so agonizing. The pain is entirely absent in some cases. Tenderness may not be elicited unless the pressure is firm enough to produce some flexing of the spinal column. Rigidity of the muscles of the back is rarely pronounced except in those cases in which there is considerable involvement of the spinal nerves and usually of the membranes. The nerve-root and meningeal symptoms are among the earliest in extramedullary tumors. They are at first usually unilateral and later bilateral. In those cases in which the tumor is situated in regions of the canal that are narrow, as in the upper cervical and dorsal regions, the indirect symptoms of nerve-root origin arising from the cord being crowded against the bones of the opposite side of the canal, may be more pronounced late in the disease than those that arise from the direct irritating effects of the growth. Eskridge has seen 2 cases in which the tumor had caused displacement of the cord, and crowded the nerve-roots of the opposite side against the bones of the spinal canal; and in each the indirect symptoms were as great as, if not greater than, the direct ones.

Cord symptoms manifest themselves early in intramedullary growths, and are usually at first unilateral in character, but soon become bilateral. If the tumor begins in one of the posterior horns of the cord, nerve-root symptoms of a sensory nature are the earliest. These symptoms, however, differ from those caused by an extramedullary tumor affecting principally a posterior nerve-root, in that in the former on the opposite side of the body from the one on which the nerve-root symptoms are manifest, and beginning at a level one inch or more below the level of the nerve-root symptoms, some disturbance of sensation, either subjective or objective, will be found, if carefully searched for early in the course of the disease, and cord symptoms develop about the same time that nerve-root symptoms are first complained of. In extramedullary tumors, on the other hand, nerve-root symptoms almost always precede cord symptoms for weeks or months, except possibly in rare cases in which the tumor is small and so situated as not to impinge upon the nerves before some pressure is exerted upon the cord. In such cases the growth might be located anteriorly, posteriorly, or laterally. The tumor under such circumstances would necessarily be a slowly growing one, and the symptoms would be those of gradually increasing compression of the cord, irritative in character, and not indicating destruction of cord tissue for a prolonged period at least. In intramedullary tumors, with the exception noted, the symptoms would probably be unilateral, at first those of irritation, later leading to destruction of cord tissue and abolition of function. Such symptoms would not be preceded by those of nerve-root and meningeal irritation. If the cord symptoms begin unilaterally in intramedullary growths, they soon become bilateral. It is important to bear in mind that in intramedullary tumors beginning unilaterally, while a well-defined case of Brown-Séquard paralysis, loss of motion on the side corresponding to the seat of the lesion, and loss of sensation on the opposite side is rarely seen, yet in nearly all of these the greatest loss of motion and disturbance of the deep reflexes, with weakened muscular sense, occur on the side corresponding to that on which the neoplasm is located; impaired sensation, subjective or objective, and disturbed superficial reflexes are most marked on the opposite side below the seat of the lesion in all those cases in which the tumor is situated above the lumbar enlargement. In some cases, especially in those in which the growth begins in the central canal, the symptoms are bilateral from the beginning. Nerve-root symptoms and rigidity of the muscles of the back are slight or almost entirely absent in intramedullary tumors. Muscular wasting and the reactions of degeneration are more common in intramedullary than in extramedullary tumors, except in those cases in which the growth originates in the cauda, then the symptoms are bilateral from the beginning.

Individual Symptoms. Motor.—Paralysis of more than a few muscles of one side of the trunk or of one limb rarely occurs in extradural tumors until cord symptoms develop. The exception to this is found in tumors of the cauda, in which case the paralysis is bilateral. The paralysis is usually a later symptom than pain in extradural tumors. Motor symptoms may precede the sensory by several weeks. Paralysis of the anal and vesical sphincters may take place early in tumors of the lumbar and sacral portions of the cord and in tumors of the cauda. Retention of urine may occur comparatively early in intramedullary tumors above the lumbar region. Paralysis of the sphincters only results late in the progress of tumors, intra- or extramedullary above the lumbar enlargement, except in rare instances in which the inflammation may descend and involve the lower portion of the cord. The ataxia, sometimes observed in extra- and intramedullary tumors of the dorsal region, is attended by pain in the back and other unilateral or bilateral symptoms of focal lesion of the cord.

Reflexes.—The reflexes in extradural tumors before cord symptoms develop are abolished only in the region of distribution of the affected nerves. When cord symptoms develop either from extra- or intramedullary tumors, the reflexes are affected in the same manner that they are found to be in myelitis of the different portions of the cord. Rigidity of the back muscles is rare in intramedullary tumors, but it is common in extramedullary growths. Muscular wasting and the reactions of degeneration, except in isolated muscles, denote an intramedullary or a caudal tumor.

Sensory Disturbances.—Pain is one of the earliest and most pronounced symptoms of an extramedullary tumor. It is usually at first unilateral, and radiates along the course of one or two spinal nerves. A tender point, or rather localized pain, is usually found at the distal portion of the affected nerves. Pain in the back, often severe in character, but rarely ever as agonizing as in tumor of the vertebræ, is frequently complained of in extramedullary tumors, especially when the patient tries to bend the spine freely in different directions. It is not a pronounced symptom in intramedullary growths. Hyperesthesia at first and later anesthesia are found in the area of distribution of the affected nerves. Dissociation of the sensory phenomena is common in tumors of the cord, and may be found in extramedullary tumors after the cord has become seriously affected by compression. It is not uncommon to have temperature sense abolished over areas in which tactile sense is preserved. Pain and temperature sensations may both be abolished, and tactile sense preserved. Dissociation of the sensory phenomena is rarely so typical in extramedullary tumors as is the case in neoplasms of the cord.

Vasomotor and Trophic Disturbances.—Either extra- or intramedullary tumors in the cervical region may give rise to inequality of the pupils and unilateral sweating, especially of the neck and head. Dilatation of the capillaries may take place on one side of the body in the parts below the seat of an intramedullary growth. Trophic disturbances may occur in the skin over the area of distribution of the affected nerves in extramedullary tumors. These may consist of herpetic eruptions, dryness, thickening, and harshness of the skin. The most marked trophic disturbances occur in tumors of the cauda and of the lumbar region of the cord. These are pronounced muscular atrophy, with the reactions of degeneration, bed-sores, and cystitis. In intramedullary tumors of the dorsal and cervical regions the trophic changes are largely limited to the parts on a level with the lesion.

Variability of Symptoms.—These occur in both intra- and extramedullary tumors, but are most pronounced in the latter. The symptoms vary considerably in intramedullary tumors, but the changes are never so sudden or so great as those observed in the extramedullary variety. In the former the patient slowly, rapidly, and, in some instances, suddenly, gets worse, so that it becomes apparent that without a change in the course of the disease life cannot long continue. Gradually the patient begins to improve, and this goes on for several weeks. At the end of this time the patient seems to be in nearly as good condition as he was before the change for the worse. Such sudden changes and the pronounced improvement that follows them can only be explained on the theory of acute focal myelitis, which has subsided and been resolved, or of a local hemorrhage which has been absorbed.

Course and duration of intraspinal tumors vary greatly. The course is shorter, and acute myelitis of a destructive character is more likely to occur in intramedullary than in extramedullary tumors. The intramedullary tumors usually progress steadily to a fatal termination more quickly than an extramedullary one. The average duration is from a few months to 2 or 3 years. Some exceptionally rare cases last much longer than this. Most cases steadily grow worse from month to month, although the symptoms may show much variability during a period of several months.

Diagnosis.—The questions to decide are: Is the trouble organic or functional? If it is organic, its character, or, in this instance, is it tumor? What is the location of the tumor: First, with relation to the bone; second, with reference to the cord itself; third, in regard to the membranes; and, lastly, opposite what segment of the cord does it lie? The final questions to determine, if possible are: What is the nature of the growth, and is it operable?

Is the trouble organic or functional? This question in the vast majority of instances will not be difficult to answer even early in the history of the case. In the majority of instances the symptoms are numerous and pronounced. They consist of spinal pain, tenderness, and lessened freedom of movement of the spinal column, radiating pains from the same level, muscular weakness and loss of reflexes at this level, and exaggeration of the reflexes below. All these symptoms first being unilateral in character soon become bilateral. In other words, there would be positive evidences of a focal lesion affecting the spinal column, membranes, nerve-roots, or cord. These are numerous, have been described under the head of symptoms, and are familiar to those who have become expert in examining for obscure affections of the spine and cord.

Is the lesion a tumor? The diseases that should be considered and excluded before arriving at the conclusion that a tumor exists are: Hemorrhage into the cord; a transverse myelitis without compression of the cord; caries; aneurysm; cervical pachymeningitis; neuritis; traumatic injuries of the spine and cord; and, lastly, syringomyelia.

Hemorrhage into the Substance of the Cord.—Hemorrhage that comes on suddenly, and gives rise to paralysis more or less complete in a few minutes, or few hours at most, after the first onset of the symptoms, and commonly ends in death from acute myelitis, may be mistaken for tumor of the cord. Tumor of the cord substance, especially glioma or sarcoma, might be attended by hemorrhage, as is the case with reference to these tumors when situated in the brain. In such cases, however, the history would show that spinal cord symptoms had preceded the paralysis for weeks and months. The history of hemorrhage into the substance of the cord reveals traumatism or freedom from spinal symptoms preceding the hemorrhage, while sudden paralysis from tumor would be preceded by the history of spinal symptoms.

Transverse Myelitis without Compression of the Cord.—In transverse myelitis without compression there are no nerve-root pains, spinal tenderness, or pain on bending the spinal column. The disease begins, in the vast majority of instances, bilaterally, and all the functions of the cord below the seat of the lesion are greatly affected or almost completely abolished soon after the beginning of the initial symptoms. The reverse of nearly all of these phenomena obtains in the case of tumor of the membranes and bones, and in tumor of the cord, except the nerve-root pains and spinal tenderness which are also absent in the majority of cases of intramedullary tumors.

Caries of the Spine.—Pain, limited to one or two vertebræ, tenderness of the spinous process over the same region, nerve-root symptoms, muscular rigidity, and cord symptoms are common to caries and tumor of the vertebræ, membranes, and, to a less extent, to tumor of the cord. The intense, agonizing pain in the back, both when the patient is at rest and while the spine is being moved, is not found in caries. In the latter the nerve-root symptoms are less marked than in tumor of the bone or membranes. They are absent in tumor of the cord. The symptoms are bilateral in caries, except in exceedingly rare cases. In tumor they are almost always unilateral early in the history of the disease. Rapid progress of the morbid process and failure to yield to rest would point to tumor. Deformity of the spine would exclude tumor of the cord or membranes, but not tumor of the bones. The history of syphilis or of the removal of a tumor from another portion of the body, especially a malignant tumor of the breast, would be in favor of tumor.

Aneurysm.—The advanced age of the patient, except when the subject is syphilitic, would be equally in favor of tumor and aneurysm. If the subject is young and syphilis can be excluded, aneurysm may also be excluded. If, by careful auscultation and palpation over the entire back, no aneurysmal bruit is detected, it is useless to consider aneurysm as a causative factor.

Cervical pachymeningitis and intraspinal tumor have many symptoms in common. Pachymeningitis spreads over a larger vertical extent than does tumor, except in rare instances. The former more usually begins bilaterally than the latter, and gives rise to greater muscular rigidity than does tumor. Muscular wasting in tumor affects at first a limited group of muscles; pachymeningitis causes wasting in several groups. Tumor of the cord is not likely to be mistaken for pachymeningitis, because nerve-root symptoms are almost never prominent in the former.

Traumatism of the Spine.—In those cases in which the symptoms resulting from traumatism are similar to those of tumor the history will show that the symptoms immediately followed injury, and will lead to a careful examination of the spine, showing marked tenderness over a considerable vertical extent. The tenderness is much greater than in tumor of the membranes or of the cord. The history would be the main reliance in differentiating injury of the bones from tumor of the same, except that in the former the spinal tenderness involves a much greater vertical extent of the bones. It must be borne in mind that an injury of the spine may be followed by tumor; but under these circumstances there would be a history of two periods—the one immediately following the injury during which the symptoms will have been indicative of inflammation, and during the other there will have been a set of symptoms that mark the irritation caused by the beginning and development of the tumor. Traumatism of the cord in which nerve root and bone symptoms are absent would not easily be mistaken for tumor of the cord, as the acute symptoms of myelitis following trauma develop a few days after the receipt of the injury, and the patient is most commonly paralyzed immediately after the accident.

Neuritis affecting one nerve may occur from tumor. It may follow the development of tumor in the cervical region of the spinal canal, and affect one brachial plexus. Such a neuritis is due to pressure, and pressure neuritis in its early stage is not attended by tenderness over the trunk of the nerve, below the seat of the pressure, although pain is felt throughout the nerve and is most severe at its terminal end. Tenderness of the entire nerve does not take place until the neuritis descends the affected nerve. Spinal tenderness and pain in the spine on movement would probably be present in neuritis from pressure within the spinal canal. This would be absent in ordinary neuritis.

Syringomyelia, in the majority of instances, is due to a gliosis, or a benign and slowly growing tumor of the central canal of the spinal cord. The symptoms are usually bilateral, the morbid process is spread over a large vertical extent of the cord, and the disease advances slowly, and often lasts many years. Dissociation of sensory symptoms is much more typical and pronounced than is the case in tumors of the cord.

Location of the Tumor.—Is it in the vertebræ, cord, or membranes, and opposite what segment of the cord does it lie? Having satisfied one's self that a tumor exists, the next task is to locate it in some structure.

Tumor of the vertebræ is attended by pain, out of all proportion in severity to that caused by tumor of the membranes or of the cord. The pain after the disease becomes well advanced is almost constant, even while the patient is lying quietly in bed. Movements of the spine greatly increase the patient's suffering. Deformity of the spine, especially when the cervical region is the seat of the tumor, is not rare. Tenderness of the spine almost always exists, but in some cases it is not great unless severe pressure is made. There is marked rigidity of the back muscles, so that the spinal column is constantly fixed in such a position that jars are least likely to affect it. The nerve-root pains are severe, appear early, and last throughout the course of the disease, unless the affected nerves are completely destroyed. The nerve-root symptoms begin unilaterally, and the cord symptoms usually appear before they become bilateral.

Tumor of the cord usually manifests itself by unilateral symptoms. Nerve-root pains are absent, unless the tumor begins in one posterior horn, and affects the nerve-root fibers within the cord. Under such circumstances there will probably be some sensory disturbance below the tumor on the opposite side of the body. Cord symptoms begin unilaterally, unless the tumor is situated near the center of the cord. Bone, nerve-root, and meningeal symptoms are usually absent in tumor of the cord.

Tumor of the Meninges and Cauda.—The most prominent symptom of tumor of the spinal canal, extramedullary in character, is unilateral pain affecting one or two nerves, unless the cauda is involved, in which case they are bilateral from the beginning and affect many nerves of both legs. Bone symptoms, except slight pain in the back, some rigidity of back muscles, and some tenderness over a limited portion of the spine are absent throughout; cord symptoms occur late, but these are likely to appear before the nerve-root pains become bilateral.

After the tumor has been located in some structure—bone, membranes, or cord—it is not difficult to determine opposite what segment of the cord the highest portion of the tumor lies. The safe rule to follow is to ascertain the highest level of sensory disturbance—such as hyperesthesia or anesthesia—and locate the lesion about two spinous processes above this level.

What is the nature of the growth and is it operable? The history of syphilis, or evidences of constitutional infection, such as bone disease, an old iritis, the presence of sores in the mouth, or a tumor of the brain, would be in favor of the spinal tumor being syphilitic. This evidence would be strengthened by rapid development of symptoms. Scrofulous glands, or the presence of tubercles in the lungs, testes, or other portions of the body, would lead one to suspect that the spinal growth was tubercular in its nature. In the absence of syphilis or tuberculosis, tumor in the membranes of a child or young adult would probably be a fibroma or a sarcoma, and later in life a sarcoma or a carcinoma. The most common tumors of the cord are tubercular, gliomatous, syphilitic, and sarcomatous. In regard to whether the tumor is operable, this question cannot always be decided before making an exploratory incision. All tumors of the cord are inoperable—*i. e.*, those that are strictly confined to the cord substance. Some slowly growing bone tumors are removable. In all cases of tumor of the vertebræ an effort should be made to remove the growth if the diagnosis is made early, and it is fairly evident that the neoplasm is not malignant. Theoretically, all tumors of the membranes are operable, and in doubtful cases the patient should be given the benefit of the doubt, unless the contraindications to surgical procedure are too strong.

Prognosis.—Syphilitic growths yield readily to proper medication. If treatment is instituted early and before irreparable damage has been done to the cord, a complete recovery may take place. In all other kinds of growths that are not operable the prognosis is unfavorable. Life may be preserved for several months, or even for years, in slowly growing neoplasms that are not malignant.

Treatment.—Little space need be consumed in discussing the treatment of tumor of the spine, cord, or its membranes. In tumor of the meninges, unless it is quite evident that the neoplasm is not syphilitic, the patient should be placed on increasing doses of potassium iodid and inunctions of mercury pushed to the point of tolerance. In meningeal tumors, if the patient does not show the slightest improvement within 2 or 3 weeks, exploratory operation is advised. In case the symptoms grow steadily worse during this time, it is not safe to defer operating even for 2 or 3 weeks, as the structures of the spinal cord might be irreparably damaged before the expiration of 3 weeks if the tumor is growing rapidly or other conditions suddenly develop that cause considerable pressure on the cord. In inoperable tumors, if thorough antisyphilitic treatment for a period of 6 weeks is not attended by any improvement, it is not probable that further specific treatment will be followed by good results. Tubercular growths of the cord, membranes, or bones may be somewhat benefited by small doses of potassium iodid, by cod-liver oil, arsenic, quinin, iron, and a full meat diet, together with rest in bed. In all cases of tumor of the vertebræ that are not amenable to internal medication, operative interference should be instituted before the cord is seriously affected, unless there is evidence that the neoplasm is malignant. In all inoperable tumors that will not respond to specific or tonic treatment the patient should be made as comfortable as possible by rest in bed, a generous diet, relief of pain by means of anodynes, preventing the formation of bed-sores, and by taking care of the bladder and bowels.

SPINAL SCLEROSIS.—See LATERAL SCLEROSIS (Primary).

SPINAL SCLEROSIS, POSTERIOR.—See LOCOMOTOR ATAXIA.

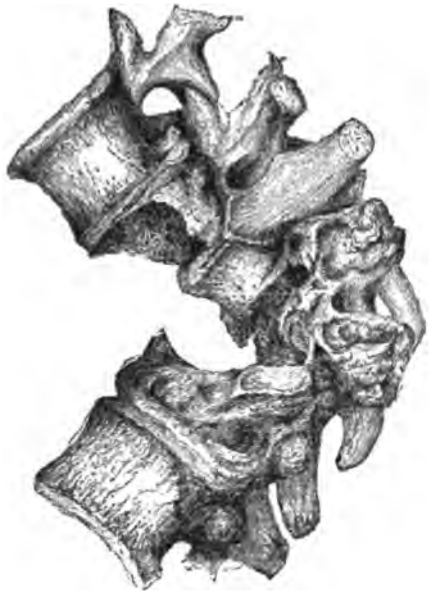
SPINE, CARIES (Pott's Disease; Tuberculous Spondylitis).—Inflammation of the vertebra is nearly always tubercular—in children, almost without exception—although it is not impossible that the immediate starting-point of the disease is some slight injury causing an extravasation of blood into the substance of the cancellous tissue. In exceptional cases it may be due to syphilis—perhaps more frequently than is suspected, in the case of adults—and late in life to rheumatism, osteoarthritis, and ostitis deformans. Tubercular ostitis is essentially a disease of childhood, although it may occur at any period of life. Sometimes it is excited by injury, and usually affects but one part of the spine, though several vertebræ, etc., are involved together.

Location.—Like tubercular ostitis elsewhere, it nearly always begins in the cancellous tissue, where growth is more rapid and the blood supply most abundant. The upper or under surface of the bodies of the anterior border is the favorite seat; the spinous and transverse processes are almost never involved at the first, although later they become welded together as the inflammation extends to them; and the articular processes only when, as in disease of the atlas and axis, synovitis precedes ostitis. The most common situation is at the junction of the lumbar and thoracic regions; here the bodies are large, and strains are felt most severely. The cervical vertebræ enjoy much greater immunity; and the two highest—in children, at least—the greatest immunity of all. There is some reason to think that disease of the atlas and axis is proportionately more common in adults. Usually, the intervertebral discs are destroyed with the bones between which they lie, the granulation tissue eating into them and causing their gradual absorption. Sometimes they disappear at a very early period, as if the force of the disease was spent on them rather than on the bodies; very rarely they persist, as when the vertebræ are absorbed by the pressure of an aneurysm.

The pathology does not present any special feature. The disease begins as rarefying ostitis, the bone becoming softer, more open, and vascular, and the bone corpuscles undergoing fatty degeneration. According to the virulence and number of bacilli on the one hand, and the strength and resisting power of the tissues on the other, resolution, caseation, or liquefaction follows.

Disease of the upper two cervical vertebræ always commences as synovitis, and extends from the articulation to the bone beneath, spreading along the most vascular lines; and, therefore, if it involves the axis, separating the odontoid process from the body.

The deformity depends upon the amount of destruction. If the caries is superficial, involving only the anterior surface of the body, and if repair begins at once, deformity may be entirely absent. If the bodies are softened or destroyed, even if only part of one, the spine sinks forward, the spinous processes project backward, and compensatory curves in the opposite direction are developed above and below. This is most distinct in the thoracic region; the lower cervical rarely becomes convex backward; only a little thickening is perceptible, and the lower lumbar practically is not so distorted. Disease between the axis and atlas is peculiar, again, in this; for, owing to the shape of the articulation on the former, the latter, when the ligaments are softened by inflammation, or when the odontoid process is detached from the base on which it rests, slips bodily forward, carrying the head with it, so that when the patient is viewed from one side, it appears as if the head were placed in front of the spine. The effect of this displacement (when it is below the third cervical vertebra) on the diameter of the spinal canal is exceedingly slight; often it is actually enlarged; exceptionally, a wedge-shaped portion is driven backward into the substance of the cord. When the upper two vertebræ, however, are concerned, the atlas slides forward and the anteroposterior measurement opposite the odontoid process may be reduced to less than 1/2 of an inch. This, if it is effected gradually, is not incompatible with life, and the odontoid process may even become ankylosed in its new situation as much as 1/2 of an inch in front of its natural one. The deformity cannot, of course, remain limited to the spine. When the cervicothoracic region is affected, the chin is brought down on the sternum so that the movements of the neck cannot be carried out; and, similarly, when the curvature is lower down, the thorax is crushed together, respiration is carried out by the diaphragm only, and the heart and the abdominal viscera are placed at great disadvantage.



Ankylosis of Dorsal Vertebræ with Great Deformity, Consequent on Caries of the Bodies.—(*Moullin.*)

Repair may commence at any time, the caseous material, if any has formed, and the debris being absorbed, dried up, or discharged externally. The vertebræ above and those below fall together; the spines, laminæ, and, in the thoracic region, even the ribs become welded into a solid mass; the sinuses gradually close up; and bony splints are thrown out in proportion to the degree of strength required.

Symptoms.—The most prominent symptoms are pain, rigidity of the back, peculiar posture, and a sense of weakness, which last, even when the child cannot describe it, can usually be recognized from the child's actions.

Pain is rarely local; nearly always it is referred to the distribution of the spinal nerves, not to their origin; thus, in atloaxoid disease it is felt over the back of the head; or, when the thoracolumbar region is concerned, over the pubes. Sometimes there is a sense of constriction around the thorax, and children often describe it as stomachache. Usually, it is worse after standing or after any exertion; lying down, it may not be felt at all. As movement causes pain, the child will guard its spine against jarring by refraining from any violent or unusual action and the surgeon should not resort to jarring of the head and shoulders in the course of his examination.

Muscular rigidity is highly characteristic; every movement of the segment of the back for some distance above and below the seat of mischief is avoided with the greatest care. If the cervical spine is involved, the whole trunk is turned around instead of the head when the patient wishes to look to one side, and it is done with the utmost deliberation. If it is the back, and the child is told to pick up anything from the floor, the hips and knees are bent, the head is thrown back, and the spine is kept absolutely rigid. Sometimes it voluntarily goes on hands and knees. For the same reason the walk is very peculiar, entirely different from the natural mobile gait, and wry-neck and other distortions are not infrequently present. When children are concerned, the weakness of the back must be judged of by their actions. They cease to play and run about; they wish to be let alone; and if they must stand, they try to support the weight of the head and shoulders by resting their hands upon the furniture, or even upon their knees, propping themselves up in a crouching attitude. With adults it is easier, as they can explain the peculiar difficulty they experience in holding themselves upright.

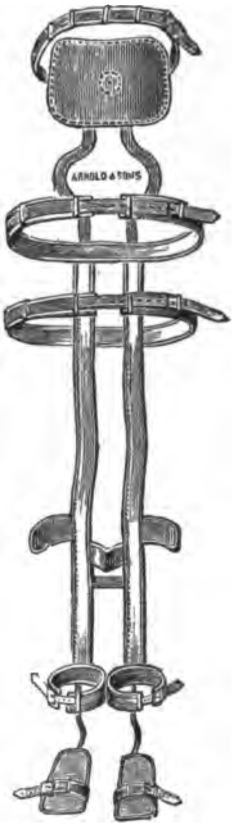
Spinal Abscess (Psoas and Lumbar).—When suppuration occurs, the pus collects in front of the diseased vertebræ in the angle formed by the falling forward of the upper upon the lower portion of the spine. The anterior common ligament and the periosteum, relaxed by the bending of the spine, yield to the pressure of the pus, and, with the pleura or peritoneum, become thickened and form the abscess wall. The pus, prevented from traveling upward by the overhanging vertebræ, from traveling downward in front of the column by the attachments of the anterior common ligament, and from traveling backward by the posterior common ligament, and by the vertebræ being less diseased behind than in front, makes its way on one or the other side of the column. There it either enters the sheath of the psoas, and, destroying the contained muscle, presents in the iliac fossa or groin as an iliac or a psoas abscess, or it passes backward through or external to the quadratus lumborum, and points in the loin, when it is known as a lumbar abscess. In rare instances the pus may take a different course. Thus Walsham has seen it make its way into the ischiorectal fossa, or pass through the great sciatic foramen, or travel along the course of a rib and reach the surface near the sternum. Ocassionally an abscess forms on both sides of the spine at once. In the cervical region the abscess will point in the pharynx (**retropharyngeal abscess**) or in the neck.

Spinal paralysis, like suppuration, may begin at any period, although naturally it is more common in the later stages of the disease. Loss of motion always precedes that of sensation, and may be nearly complete without the latter being seriously impaired. The gait becomes shuffling; the movements of one or more of the limbs are awkward; and the loss of power becomes more and more evident, with a certain degree of numbness, until at length complete paraplegia follows. As long as the cord is merely compressed, the patient may retain power over the rectum and bladder; but this, too, is not infrequently lost in the later stages. When myelitis sets in there is often severe pain along the course of the spinal nerves, with spasmodic muscular contraction; the skin becomes dry and branny; all power of the sphincters is lost; the limbs are wasted; the joints, generally speaking, are flexed; and the muscles are rigid and not infrequently thrown into violent spasmodic contractions from the uncontrolled reflex irritability of the spinal cord. Occasionally, the inflammation suddenly becomes acute, and extends upward, with symptoms of high fever, to the meninges of the brain. In disease of the cervical spine respiration may be seriously endangered either from displacement forward of the atlas and cranium upon the axis, or, when the disease is lower down, from gradual flattening of the cervical curve, owing to the softening of the ligaments. Under these circumstances any sudden movement of the head, either forward or backward, or even lying in the supine position without a support beneath the arch of the cervical spine, may cause immediate asphyxia.

Diagnosis.—In the early stages caries must be differentiated from neuralgia, rheumatism, lumbago, aneurysm, tumors, and hysteria; in the later stages the angular curvature may have to be distinguished from the kyphotic curvature of rickets.

From **neuralgia, rheumatism,** and **lumbago** it is not always easy to distinguish it. The history of the former rheumatic attack, the effect of remedies, and the absence of the signs described, must then be relied upon.

Hysteria may simulate it very closely. The absence of signs of caries, except pain; the inconstant and more diffused character of the pain; and the presence of other signs of hysteria or of uterine disease, are the points to be attended to.



Double Thomas' Splint for Spinal Caries.

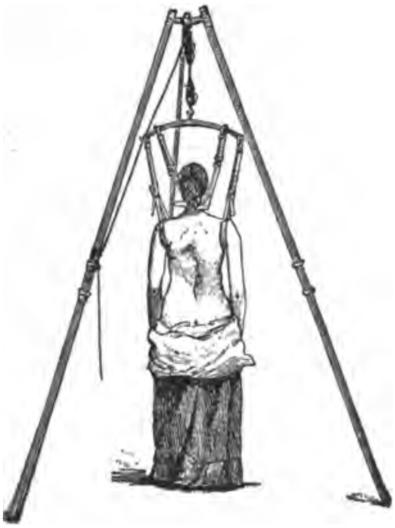
A careful auscultation of the chest and examination of the abdomen will usually serve to exclude **aneurysm.**

From **tumors** of the vertebral bodies leading to the breaking down of the vertebræ caries cannot at first be differentiated, as both give rise to the same symptoms; but the age of the patient and the presence of a carcinomatous growth elsewhere would lead to suspicion of cancer.

The curve of **rickets** is more generally kyphotic, and disappears completely on gently holding the child up by its arms, or on extending it with its face downward across the nurse's knee. There are, moreover, concomitant signs of rickets, and absence of those of tubercle.

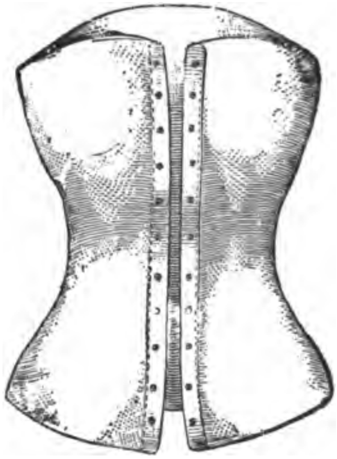
Treatment.—The general principles are those of the treatment of tuberculosis. With very few exceptions local removal of the diseased portion is out of the question; all that can be done is to improve the general health and to subdue the local inflammation, in the hope that the tissues may be able to cope successfully with the disorder.

Rest is the first consideration. In most cases it is advisable to confine the patient, for a time at least, to the recumbent position, on a well-made hair mattress, with sand bags as splints. In disease of the upper cervical vertebræ rest is absolutely essential, a bag being placed on each side, coming well down against the shoulder, and a third smaller one under the arch of the spine. If the patient's condition is favorable, this may be kept up for many months without the least deterioration in health; indeed, distinct improvement is not uncommon, especially when the pain has previously been severe. Later, when the acute symptoms have subsided the back may be incased in some kind of splint, and the patient allowed very gradually to begin to move about. To insure absolute recumbency Walsham uses a double Thomas' splint, modified by the addition of a pelvic band, a support for the shoulders, neck, and head, and two sliding foot-pieces. The two upright bars, which are prolonged to the head support, are made after the shape of a normally formed child when in the recumbent position.

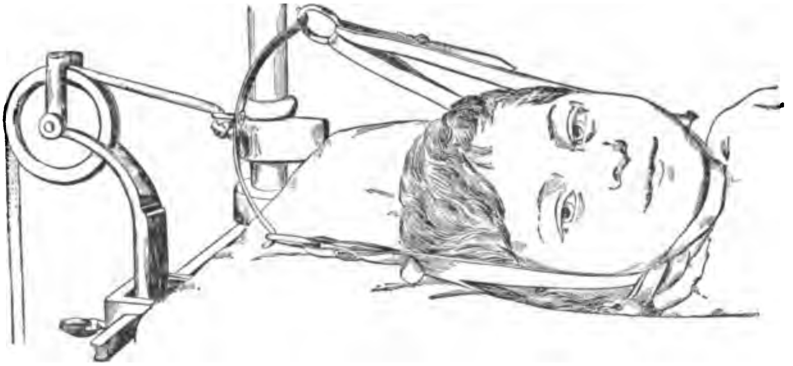


Sayre's Tripod.

The supports most in use at the present day are Sayre's plaster-of-Paris case and Cocking's poroplastic felt jacket, though some surgeons prefer steel instruments. The plaster-of-Paris case may be applied with the patient either in the upright position, suspended with his heels just off the ground by Sayre's tripod, or in the recumbent position, by Davy's hammock apparatus. A skin-fitting vest having been previously applied, and a line drawn across the back with a pencil at the level of the axillæ, to indicate the upper limit of the jacket, crinoline bandages, impregnated with plaster-of-Paris, are wound round and round the trunk, until a sufficient thickness is obtained, dry plaster being from time to time rubbed in with the hand. The cast should reach from the pencil line to just below the crest of the ilium, stopping short of the great trochanter and the pubes, and may be strengthened, if necessary, in places by inserting strips of perforated tin vertically between the bandages. Before applying the bandages a folded towel should be placed over the abdomen beneath the vest, so that, when afterward withdrawn, space will be left for abdominal respiration (Sayre's stomach pad). When the plaster case is dry, it may be sawed through down the front, removed, and the fronts edged with leather and perforated with eyelet-holes, so that it can be worn laced up, and can be taken off from time to time. To apply the poroplastic felt, the jacket, which is first made to measure, must be put in a steam oven, and when rendered thoroughly plastic, further molded to the patient, who should be prepared and suspended in the same way as for applying plaster-of-Paris. Of steel instruments, that known as Taylor's is perhaps the best. When the disease is in the cervical or upper thoracic region, Sayre's jury-mast may be fitted to the plaster-of-Paris cast or poroplastic jacket; or a cervical collar composed of leather or poroplastic felt may be used; or, better, the combined poroplastic jacket and collar.

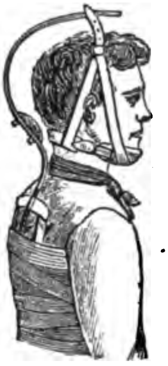


Sayre's Plaster Jacket.



Head Extension for Pott's Disease.—(*Young.*)

The treatment of a tubercular abscess is either expectant or operative. Many of these are readily absorbed when proper mechanical support is afforded and the general health is improved. There are three indications for operative interference, viz: if the abscess is rapidly increasing in size, if it is interfering with the health of the patient, or if it is pointing, but unless one at least of these is present, a tubercular abscess should be left alone. Aspiration may be employed first to stay the progress of the abscess and possibly to remove it entirely. Force should not be used in aspirating, and it may be repeated frequently provided the trocar be inserted into healthy tissue each time. In these abscesses lavage of the sac with iodin water, followed by injection of iodoform emulsion, is of great benefit. The trocar and cannula used for evacuation should be large enough to prevent clogging during the outflow, and the puncture should be sealed with iodoform collodion laid on a thickness of gauze.



SAYRE'S JURY-MAST.

In some cases in which necrosis has been associated with caries success has attended the removal of the sequestrum through a properly planned incision made in the loin. In exceptional cases, in which the paralysis of the lower limbs continues in spite of absolute rest and recumbency, and in which there is intractable cystitis or severe pain not relieved by ordinary measures, the spines and laminæ of the affected vertebræ may be excised for the purpose of relieving pressure on the cord. The compression of the cord, however, would appear to depend more often on the presence of a tuberculous collection in front of or about the cord than on displacement of bone.

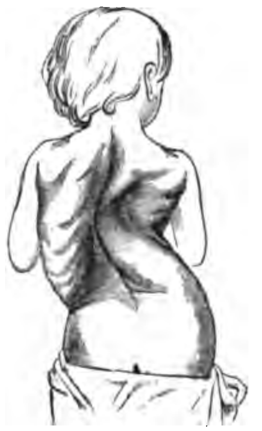
Unless, therefore, the tuberculous abscess can be evacuated, the removal of the arches of the vertebræ is futile, and only tends to weaken the vertebral column. In place of laminectomy an attempt may, in suitable cases, be made to reach the tuberculous collection from the front of the vertebræ. Ménard has succeeded in doing this by excising the transverse processes and proximal ends of the ribs corresponding to the most prominent part of the spinal curve. Through the aperture thus made he was able to scrape and wash away tuberculous material, with the result that the paralysis quickly disappeared (Walsham).

SPINE, CURVATURE.—The spine may become curved, either from primary disease of the bones and joints (caries, osteoarthritis, new growths, etc.), or from weakness of the muscles whose function it is to maintain the erect position, the vertebræ only becoming affected secondarily after the deformity has already lasted some time, owing to the unequal distribution of the weight they bear. The direction may be either anteroposterior or lateral, although the latter rarely occurs by itself. The former is known as excurvation, or **kyphosis,** when the projection is convex backward; as incurvation, or **lordosis,** when it is convex forward. The lateral bending is known as **scoliosis.**

Scoliosis.

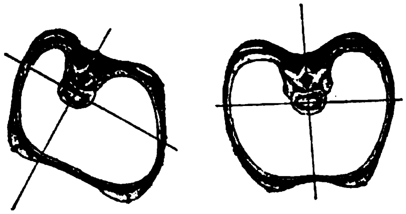
Scoliosis, or **lateral curvature,** is a complicated distortion in which the spine forms two or more lateral curves, with their convexities in opposite directions, while the vertebræ involved in the curves are rotated on their vertical axes so that the spinous processes are directed toward the concavity of the curves.

Etiology.—The immediate cause that underlies the formation of lateral curvature is the unequal compression of the intervertebral cartilages for long periods. This unequal compression may be induced (1) by any condition causing permanent or habitual obliquity of the pelvis and the consequent throwing of the spine over to the opposite side, such as unequal length of the legs, knock-knee, flat-foot, the use of a wooden leg, habit of standing on one leg, sitting cross-legged, congenital dislocation of the hip, etc.; (2) by a one-sided position of the body in sitting, standing, or lying, or produced by certain employments, as nursing or carrying with one arm, etc.; (3) by contraction of one side of the chest following empyema; (4) by unilateral contraction of the spinal muscles following paralysis of the opposing muscles. The conditions mentioned under 1 and 2 are, however, by far the most frequent causes of the deformity. Although lateral curvature may be induced by these causes acting alone, there are certain circumstances that appear especially to predispose to the deformity, by producing a general want of tone in the muscles, and structural weakness of the ligaments and bones. Such are (1) heredity, (2) general debility, (3) the strumous diathesis, (4) rickets, and (5) rapid growth. It is much more frequently met in girls than in boys, and is most common from about the age of 14 to 18 (Walsham).



EXTREME SCOLIOSIS.—(*Moullin*)

Pathology.—The long-continued unequal compression of the intervertebral cartilages causes them to become wedge-shaped, and the portion of the spine corresponding to the compressed cartilages to assume sooner or later a permanent lateral curve. While, however, a curve is thus being produced, say, in the thoracic region, with its convexity to the right, a compensating curve, in order to maintain the equilibrium of the spine, is being simultaneously produced in the lumbar region with its convexity to the left. Coincidently with these changes a rotatory movement of the affected vertebræ upon their vertical axes is taking place; so that while the bodies turn toward the convexity of the curve, the apices of the spinous processes turn toward the concavity. Hence, in addition to the formation of the primary and the secondary or compensating curves, we have a twisting round of the spine within these curves, as a consequence of which the ribs on the convex side are carried backward with the transverse processes, causing the angle of the scapula on that side to project; while the ribs on the concave side are for the same reason carried forward, producing a prominence of the corresponding breast (as shown in the accompanying illustration).



To Show the Effect of Rotation in Lateral Curvature of the Spine.—(*Walsham.*)

Symptoms.—Pain or a feeling of weakness in the back, general lassitude, and a stooping gait are among the early symptoms; but the patient is generally first brought for consultation on account of a slight projection of the scapula, or of an apparent prominence of the iliac crest—a growing out of the shoulder or of the hip, as it is popularly termed. In mild cases there may be little or no lateral deviation of the apices of the spinous processes, and that present may be made to disappear on suspending the patient or on placing her in the prone position. In the severer cases, however, the signs are unmistakable. Thus, in the more common forms there are usually a thoracic curve, with its convexity to the right, and a shorter lumbar or thoracolumbar curve, with its convexity to the left. The right shoulder is generally elevated, and the angle of the right scapula, right iliac crest, and left breast are prominent, while the left lumbar muscles, in consequence of the backward projection of the left lumbar transverse processes, stand out as a prominent ridge and give a greater sense of resistance on pressing over them than normal. In other cases the compensating curves may be so slight that there is apparently a single curve only, with its convexity either to the right or left, involving the whole spine or chiefly the upper thoracic or the lumbar vertebræ, and producing more or less projection of the scapula or apparent prominence of the iliac crest, etc., according to its severity and situation.

Method of Examination.—The clothing is so arranged that the body above the iliac crests and the gluteal cleft can be inspected from all sides. If, from the height of the crests, there is any reason to suspect inequality of the lower limbs, this must be investigated first, and compensation made by placing a book under the shorter leg. At first the patient stands upright, with the feet together, in a natural, unconstrained position. If the muscles are rigid and contracted, so that the attitude is stiff, they nearly always give way in a minute or two. In the meantime the tip of each spinous process is marked with an anilin pencil. In an ordinary case, with the dorsal convexity on the right, the scapula on that side is higher and more prominent, the chest fuller, and the iliac crest better marked, with a deep depression between it and the ribs. On the left, the outline of the body is nearly straight. Seen from the side, the head projects forward, the thorax is flat, half concealed by the shoulders, and the lower part of the abdomen projects, owing to the anteroposterior bend that, when the muscles are weak, nearly always complicates the lateral one. In front, the left breast stands out more than the other, and the asymmetry of the thorax is even more distinct. Next, the patient is directed to stoop forward, the knees being kept straight, the head bent down, and the arms hanging loosely in front. This gives an idea of the amount of rotation. The ribs posteriorly are uncovered, and the projections backward of the lower part of the chest on one side, and of the erector spinæ in the lumbar region on the other, are brought prominently into view. It is often of service to keep a record of this position by molding a malleable piece of lead (as suggested by Roth) transversely to the ribs, between the angle of the scapulæ, and taking a tracing from this on paper. If the deformity is conspicuous, a second tracing may be taken opposite the third lumbar spine.

Afterward the patient is directed to straighten her back by her own unaided efforts; and if, as is probable, this merely results in increasing the deformity, an attempt must be made, by manipulating the trunk and the limbs, to see how far it is possible for the muscles to restore the symmetry. In cases in which there is no osseous deformity this can usually be done by placing the patient in what Roth has called the key-note position, with the right arm directed upward, and the left one at right angles to the trunk.

The prognosis depends chiefly upon the state of the vertebræ. If they are not yet affected, the patient can generally be cured, if she will take sufficient trouble, although relapses are almost sure to occur from time to time until the development of the trunk is complete. If, on the other hand, osseous deformity is already present, neither rotation nor curvature can be corrected, except in very early cases; and when there is evidence of recent rickets, all that can be done is to prevent them from becoming worse.

Treatment.—When there is evidence of general or muscular debility, the health and muscular tone should be improved by suitable remedies, the avoidance of late hours, of fatigue, and the like; the exciting cause of the curvature should be looked for and, if possible, removed. In slight cases these means, when conjoined with a judicious selection of muscular exercises and partial recumbency, will generally serve to cure or to improve the curvature, or, at least, will prevent it from getting worse. But in severe cases, when osseous changes are already confirmed, some form of rigid support, as a poroplastic jacket or a light spinal instrument, will commonly be required, especially for the poorer classes of patients. In ordering such supports, however, the patient should be made to understand thoroughly that no real improvement of the curvature must be expected from them, their only aim being to relieve pain when present, to give a sense of comfort and support, to improve the outward appearance, and to prevent further deformity. In slight cases they should on no account be used. The exercises employed are directed in part to improving the muscular tone generally, and in part to strengthening those muscles in particular that tend to lessen or straighten the curves. For the former purpose, such exercises as swinging by the hands from a bar, forcibly stretching an elastic cord fixed to the floor, and dumb-bell exercises should be practised. For strengthening the muscles in particular that tend to straighten the curve, the back should be manipulated until that posture is found in which the curves are least marked, and the patient should be made to hold herself in this position as long as possible. At first she will be only able to do this for a few minutes at a time; but by frequently assuming the posture the muscles thus brought into play are gradually strengthened, until at last the improved posture is maintained constantly and without effort. For further improving the tone of these muscles, Busch and Roth recommend exercises similar to the followng: The patient's body, held in the improved posture, is brought over the end of a couch or table, and while she is prevented from falling by an assistant holding her legs, she alternately flexes and extends her body at the hips, the surgeon resisting her efforts. Some surgeons use the sloping seat, as recommended by M. Bouvier and Mr. Barwell, in counteracting the curves. A similar effect may be obtained by wearing a thick sole on one boot, and by sitting on the off side of the horse when riding. After the exercises, or twice or thrice during the day, the patient should lie on her back for from half an hour to an hour; and while sitting, her back should be supported by a reclining chair. Walsham has had considerable success in removing rigidity in cases where there is slight osseous deformity by applying a weight to the convexity of the curve, the patient standing with her legs straight and body horizontal, and being supported in this position by her elbows on a chair.

Kyphosis.

Kyphosis is a general curving of the spine with its convexity backward or an exaggerated condition of the normal dorsal curve. It depends upon an unequal compression of the intervertebral cartilages and, to a less extent, of the vertebral bodies, which thus become wedge-shaped, with their bases looking posteriorly. It is generally the result of muscular debility, rickets, slouching habits, or occupations necessitating stooping.

Symptoms and Diagnosis.—The chief point of interest is to distinguish it from the serious angular curvature induced by caries. In children and in adults this is generally easy; but in rickety infants, in whom the ordinary test for caries cannot be applied, it is often very difficult. In such a case the infant should be placed across the nurse's knees and gently extended, when the rickety curve will disappear, but the angular curve will remain. The back, moreover, in caries, is rigid, and the child is uneasy in this position and tries to resist the extension by muscular effort, and draws up his legs. In rickets the back is flexible and there are other signs of rickets.

Treatment.—In the infant, recumbency; in growing lads and girls, the correction of stooping habits by the use of muscular exercises and a spinal brace, with partial recumbency and tonics, is the treatment usually indicated. For the confirmed kyphosis of the old, nothing can be done.

Lordosis.

Lordosis, or curving of the spine with the convexity forward, is a symptom rather than a disease, inasmuch as it is formed as a compensatory curve to restore the equilibrium of the spine when from any cause its normal antero-posterior curves are disturbed. Thus, it is most common in the lumbar region, where it is merely an exaggeration of the normal curve, and is there produced to counterbalance the tilting forward of the pelvis consequent upon hip-disease, congenital distortion of the hips, rickets, etc.

SPINE, DISEASES.—See SPINE (Caries, Curvature), SPONDYLITIS DEFORMANS.

SPINE, INJURIES.—**Sprains** of the spine are exceedingly common, and may be caused by any violent twist or bend of the back. See BACK (Injuries).

Dislocation and Fracture.—Dislocation of the spine without fracture is extremely rare; indeed, except in the cervical region, it is said never to occur. Fracture unaccompanied by dislocation is also uncommon; but uncomplicated cases of fracture of the spinous process and laminæ, and, more rarely, of the transverse and articular processes, are sometimes met with. In the majority of cases fracture and dislocation are combined. Thus, usually there is fracture of the body and of the articular processes of one or more vertebræ, with dislocation of the whole of the spine above the seat of injury from the spine below. This common form of injury is known as fracture-dislocation.

Fracture-dislocation is either the result of direct violence applied to the spine, or of indirect violence, as a fall upon the head.

When the result of **direct violence,** which can only be applied to the posterior part of the spine—one or more of the spinous processes may be detached without implicating the vertebral canal. When the violence is very great—as in a fall from a height on the back across a beam or rail, or as the result of a severe blow, as from a crane—the spine is bent violently backward, tearing asunder the structures forming the anterior segment of the column and crushing those forming the posterior segment. Hence the vertebral bodies are generally uninjured, but are wrenched apart, the intervertebral cartilages are ruptured, the anterior common ligament is torn, and the arches of the vertebræ and of the articular and spinous processes are crushed. The vertebræ above the injury are dislocated forward, as, the articular processes being fractured and the intervertebral cartilages torn, nothing remains to keep them in position.

In fracture from **indirect violence**—such as may be received in a fall from a height upon the head, or catching the head while passing under an arch, or from a weight falling upon the head or shoulders—the spine is bent violently forward, crushing the anterior part of the column and tearing the posterior part asunder. Here one or more of the bodies and intervertebral cartilages are crushed between the vertebræ above and the vertebræ below, one of the fragments of the fractured body being frequently driven backward into the vertebral canal, while the arches and the spinous and articular processes are wrenched asunder. Fracture of the sternum is occasionally combined with this injury, in consequence, it is said, of the chin coming into violent contact with the sternum as the spine is doubled forward.

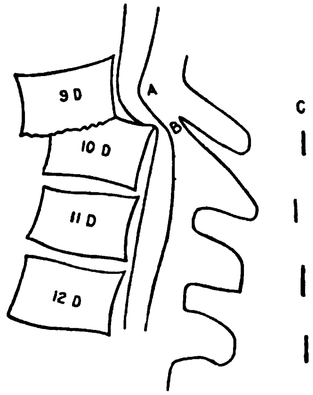


Diagram of Fracture-dislocation of the Spine, showing compressions of the cord by the laminæ of the 9th dorsal vertebra (*A*), and by the body of the 10th dorsal vertebra (*B*). *C*. Spines in same case as felt from the rear.

Condition of the Spinal Cord.—The importance of fracture-dislocation of the spine lies not so much in the fact that the vertebræ are fractured, as that the cord is generally injured. When the vertebræ are not displaced, the cord may at times altogether escape. More commonly, however, it is compressed; or, perhaps, completely divided; or, again, so bruised that it rapidly undergoes inflammatory softening. When the injury is situated below the second lumbar vertebra, the cord necessarily escapes, as it terminates at that spot; but the nerves of the cauda equina may then be injured.

Symptoms.—The local signs are often but little marked. There may be pain at the seat of injury, or some inequality in the spinous processes; but as often as not these are absent. The general signs depend upon the condition of the cord, and none will be present when it has escaped injury. But when it is compressed or crushed, there will be paralysis of the parts below, more or less complete according to the extent of the lesion. Taking as an example a case of fracture in the lower cervical or upper thoracic region, the most common situation, with severe compression or crushing of the cord, there will be paralysis of both motion and sensation of the whole of the parts below the seat of injury (paraplegia), and perhaps a zone of hyperesthesia immediately above the injured part. The intercostal muscles being paralyzed, respiration can only be carried on by the diaphragm, this muscle receiving its nerve supply through the phrenics that are given off above the seat of injury. Hence, while the chest is motionless, the abdomen rises and falls during respiration. The bladder and rectum and their respective sphincters share in the paralysis, so that there is at first retention of urine and of feces, followed by passive overflow of urine as the bladder becomes distended and will hold no more, and by involuntary passage of feces. Priapism, or involuntary erection of the penis, is frequently present, or is induced by the use of the catheter. The temperature varies: sometimes it may be lower than the normal, but often it is considerably elevated, even reaching as high as 107° F. shortly before death. Consciousness, unless any head injury has been received at the same time, is not affected. The reflexes in the lower limbs are usually at first in abeyance, but may return if the patient does not succumb to the shock of the injury. If the reflexes remain quite lost, the probabilities are that the conducting power of the cord has been completely destroyed. If they return, it is a sign that some power of conductivity is left in certain portions of the cord at the seat of injury. Death occurs, as a rule, in from 24 hours to a few days, from bronchial trouble; but the patient, if the fracture is in the upper thoracic region, may linger from 2 to 3 weeks. The secondary troubles that are then generally met with are bed-sores and chronic cystitis, probably due in part to impaired nerve influence, and in part to slight injury in the passage of a catheter, or to the introduction by the catheter of a microorganism—the micrococcus ureæ.

Such may be taken as a typical example of fracture of the spine as commonly met with in surgical practice. But the nature and gravity of the symptoms will depend upon the situation of the fracture, and upon the amount of injury to the cord. Thus, in some cases of fracture there may be no paralysis; in others, the paralysis may be incomplete: *i. e.*, confined to loss of motion only, or to paralysis of one limb or one group of muscles, or to impairment of sensation over some limited area. Such cases, however, are much less common than that previously described (Walsham). The X-rays should always be employed when possible, to determine the extent and character of the injury to the bony parts.

The prognosis will depend in great measure on the situation of the fracture and on the condition of the cord. Thus, when the fracture is in the cervical region, if death is not instantaneous, the patient may survive from 12 hours to 2 or 3 days; usually, however, death occurs in about 24 hours;

when in the upper thoracic region, the patient may linger for 2 or 3 weeks; when in the lower thoracic region, if he survives the period at which the inflammatory troubles commonly occur, he may recover, remaining, however, if the cord is severely injured, paraplegic; when in the lumbar region, he may recover, with perhaps only partial paralysis of one or other of the lower limbs or of a certain group of muscles, or even without any paralysis whatever. But even when the injury to the cord has been so high as to cause paralysis of the whole body below the neck, patients have been known, in rare instances, to live for several months, or even for years.

Treatment.—In cases in which there is no paralysis, thus showing that the cord is not affected, the indication is to keep the fractured spine at perfect rest, for the purpose not only of obtaining union of the fracture, but also of preventing by any movement displacement of the fragments and injury of the cord. In the more common cases, when there is paralysis, showing that the cord is injured, the indications are to remove any fragments that may be compressing the cord, and subsequently to keep the parts at rest until union of the bones has occurred. When, however, as is too frequently the case, the removal of the fragments is not practicable, or the cord itself has been crushed, all that can be done is to endeavor to guard against the formation of bed-sores and the occurrence of chronic cystitis and its attendant evils. Thus, the patient should be placed upon a water-bed, and his posture gently changed from time to time, so that pressure may not be continuously made on one part, while he must be kept scrupulously clean and dry, and free from urine and feces. The bowels should be cleared, if necessary, by enema, or excessive diarrhea controlled by morphin suppositories or by starch and opium injections. Should bed-sores threaten, the skin should be hardened by sponging with rectified spirit, and dusted with oxid of zinc and starch-powder. If formed, they should be dressed with mild antiseptics, iodoform, balsam of Peru, etc., and all pressure removed from the surrounding skin by the use of water-cushions. To prevent cystitis from occurring, a soft-rubber catheter, thoroughly cleansed in carbolic acid and dipped in carbolic oil, should be passed twice daily. Should the urine become alkaline, the bladder must be washed out with some antiseptic solution, as salol (10 grains to 1 ounce) or boric acid (10 grains to 1 ounce).

Extension of the Spine.—In cases in which, from the marked inequality of the spinous process, there is a probability of fragments pressing upon the cord, a cautious attempt to extend the spine and to reduce the displaced vertebræ may be made, and a plaster-of-Paris case may be applied during the extension.

Laminectomy is the operation of removing the posterior vertebral arches. It is performed for the purpose of relieving pressure on the vertebral cord, but is contraindicated when it is likely that disorganization of the cord has been effected. An incision is made down the vertebral spines of the patient, who lies prone, with a firm sand-pillow under the lower ribs. The spinous processes and the laminæ are cleared, and the periosteum is incised and lifted away from the arch. Forceps remove the spinous processes close to their bases, and the laminæ are cut off on each side by rongeur forceps, exposing the dura mater. Fragments may be found exposing the vertebræ, and a blood-clot may exist between the dura and the bone. The dura may be incised and the clot removed, or the dura may be closed with catgut, the wound drained throughout by a tube, the superficial parts being closed with silkworm-gut, and antiseptic dressings applied. In operating, hammers and chisels should not be used, on account of the jarring to the structures.

SPINE, TUMORS. See Spinal Cord (Tumors).

SPIRILLUM FEVER.—See Relapsing Fever.

SPIRITS.—Alcoholic solutions of volatile substances, which may be solids, liquids or gases. They are officially prepared either by simple solution, by solution with maceration, by gaseous solution, by chemical reaction, or by distillation. The menstruum is alcohol in nearly all instances, 4 having water in addition, and 2 being alcoholic liquors of a specified alcoholic strength (whisky, brandy). The official spirits are 20 in number; those made from volatile oils are frequently called *essences*.

Spiritus ætheris (32 1/2); **S.** ætheris compositus (32 1/2); **S.** ætheris nitrosi (4); **S.** ammoniæ (10); **S.** ammoniæ aromaticus (9); **S.** amygdalæ amaræ (1); **S.** anisi (10); **S.** aurantii compositus (20); **S.** camphoræ (10); **S.** chloroformi (6); **S.** cinnamomi (10); **S.** frumenti (37 to 47 1/2); **S.** gaultheriæ (5); **S.** glycerylis nitratis (1); **S.** juniperi (5); **S.** juniperi compositus (64 1/2); **S.** lavandulæ (5); **S.** menthæ piperitæ (10); **S.** menthæ viridis (10); **S.** vini gallici (39 to 47). The figures placed after spiritus frumenti, spiritus juniperi comp., and spiritus vini gallici, represent the percentage of absolute alcohol by weight in each; those placed after the others indicate the quantity of the principal ingredient in grammes to each 100 cubic centimeters of the preparation.

SPIROSAL.—The monoglycol ester of salicylic acid. It is an efficient external remedy in rheumatic affections. When rubbed into the skin, it is nonirritant and readily absorbed, and it liberates salicylic acid in the tissues.

SPLEEN, DISEASES. Physical Examination.—The spleen lies in the left hypochondriac region, the internal or concave surface being in close relation with the greater curvature of the stomach and tail of the pancreas; the upper border lying immediately under the diaphragm; the lower border covers the left suprarenal capsule and a small portion of the kidney, to which it is attached by areolar tissue. It extends transversely from the upper border of the ninth to the lower border of the eleventh ribs, and anteriorly to the mid-axillary line. The patient is placed in the recumbent posture. By **inspection,** enlargement of the organ is detected.

Palpation confirms inspection, detects tenderness, position and character of enlargement, whether hard or soft. In the normal condition the organ does not admit of palpation. The spleen is said to be enlarged when the anterior surface can be felt at the free margin of the ribs on deep inspiration, or if it projects beyond the midaxillary line on percussion.

Percussion.—The patient is placed in the recumbent position on the right side, with the thighs flexed. Deep percussion is necessary, and should begin in the midaxillary region over the lung, gradually going downward in order to detect impaired resonance over a more dense medium. Dulness is usually elicited at the upper border of the ninth rib, and extends downward to the lower border of the eleventh rib, when tympany exists over the region of the intestine. The anterior border is determined by first percussing over the bowel, gradually moving toward the splenic dulness, which is found in health in the midaxillary line. If it projects beyond the midaxillary line, the organ is said to be enlarged.

Morbid conditions of the spleen arise as the result of some general disease, such as malaria, leukemia, syphilis, or by extension of some inflammatory process from a neighboring organ.

Splenitis.—This may be the result of traumatism or extension of a septic process from the stomach, perinephritic abscess, or disease of the diaphragm. It is recognized by enlargement and tenderness of the organ.

Perisplenitis may be due to extension of inflammation from adjacent tissues or from traumatism. The resulting adhesions cause pain during respiration. There may be palpable crepitus over the spleen.

Treatment.—Relief may be obtained by counterirritant and 10 percent iodin inunctions.

Splenic abscess occurs occasionally during the course of pyemia. It may break into the stomach, intestines, lungs or peritoneal cavity.

Rupture of the spleen is caused by traumatism or pernicious malarial fever. In this condition there is a sudden sharp pain in the region of the spleen, accompanied by evident symptoms of collapse.

Tumors of the Spleen.—The spleen may be the seat of gummatous tumors, or of an echinococcus cyst.

Amyloid spleen occurs as the result of prolonged suppurative process, as in tubercular bone-disease, and may be associated with amyloid liver and kidney.

Echinococcus of the Spleen is associated with similar infection elsewhere. The characteristic hooklets may be recognized in the aspirated fluid. The spleen presents a fluctuating tumor which is distinguished from abscess by the absence of symptoms of sepsis (chills, fevers, etc.) Echinococcus disease may, however, take on a purulent form.

Movable spleen is due to elongation of the gastrosplenic ligament and blood-vessels.

Symptoms.—Absence of the normal splenic dulness, the presence of a movable hard tumor in the lumbar or epigastric regions, accompanied by a dull, dragging sensation in the affected parts may distinguish the condition.

Treatment consists in the application of a pad and an abdominal binder. Prolonged rest in bed is necessary to obtain relief.

SPLENIC ANEMIA (Splenic Pseudoleukemia).—A chronic anemia characterized by progressive hypertrophy of the spleen, without the glandular enlargement of Hodgkin's disease.

The **etiology** is unknown, but infectious diseases and intestinal infection are believed to be factors.

The **symptoms** and **blood changes** are similar to those of pernicious anemia. These include pallor, dyspnea, palpitation, progressive weakness, enlarged spleen; and later, emaciation, deeper yellow hue of the skin, tendency to hemorrhages, fever, serous effusions, diarrhea. The red blood cells are diminished. The **hemoglobin percentage** is lowered, but is relatively less than the corpuscles. Later in the disease there is ascites due to cirrhosis of the liver (Banti's disease, *q. v.*). The disease is a protracted one.

Treatment.—Nutritious food, arsenic, iron and bone-marrow are indicated as in other anemias. About 75 percent of recoveries are reported to have followed splenectomy. This operation is contraindicated in profound cachexia. Talma's operation has also been performed in few cases.

SPLENIC EXTRACT.—The substance of the spleen has been recommended in malaria, tuberculosis, typhoid fever, and in various disorders of the blood. The ethereal extract, in the form of an emulsion containing 5 grains to the dram, is the most active preparation. It is given in daily doses up to 4 drams.

SPLENOMEGALY, TROPICAL.—See KALA-AZAR

SPONDYLITIS (Tuberculous).—Acute osteomyelitis of the spine. A rare infection due to the same causes as osteomyelitis elsewhere. (See under BONE, Diseases.) It is too diffuse and rapid for successful surgical treatment. See SPINE (Caries).

SPONDYLITIS DEFORMANS.—A form of arthritis deformans characterized by a striking rigidity of the spinal column. If not associated with kyphosis it has been called "poker back." It may be accompanied by osteoarthritic changes in the shoulder and hip (Spondylose rhizomelique).

SPONDYLOLISTHESIS.—A slipping forward of the lumbar upon the sacral vertebræ.

SPONDYLOSE RHIZOMELIQUE.—Ankylosis of hip, spine and shoulders, occurring chiefly in old men. See SPONDYLITIS DEFORMANS.

SPONGES.—Marine sponges are especially used in operations on the throat and abdomen—in the former because mucus adheres, in the latter because the omentum and intestines do not adhere to marine sponges, whereas the reverse is the case with those made of wool or gauze. Owing to the difficulty in preparing and cleaning them, they are not generally used except as above. Marine sponges must first be freed from sand and remains of marine organisms by prolonged soaking and kneading in water. Then they are covered for a day with sulphurous acid 20 percent or 1 in 5, alternatively with hydrochloric acid 8 percent, or with permanganate of potassium 1 in 400, followed by saturated oxalic-acid solution to decolorize. After all acid has been washed away the sponges are placed in a jar covered with 1 in 20 carbolic acid, where they should remain at least a day before use. They may be so preserved indefinitely, merely becoming browner, or the sponges may be counted into linen bags, which are tied, labelled, and then hung up to dry in the air. Such sponges are then ready for use at any time with sterile water. After use, sponges must not be put straight into carbolic acid, but must soak in warm water and be kneaded at intervals for a day or more until all the fibrin of the blood has become dissolved, which it will soon do, unless it has been coagulated by heat or by carbolic acid. When the water in which the sponges are being kneaded remains clear, the sponges are treated with sulphurous acid followed by carbolic acid as above described. But all sponges which have come in contact with infective material should be burnt. (Spencer and Gask.)

SPOROTRICHOSIS.—A subacute or chronic disease affecting chiefly the skin and subcutaneous tissues, due to the sporotricha, which can be identified in culture made from the pus. Nodules or abscesses or ulcers appear which may be mistaken for furunculosis, blastomycosis, tuberculosis, syphilis, etc. Lesions may be found in the bones or joints or the muscles. At times the eyes, nose, throat, or epididymis may be invaded; or the infection may become general, accompanied by pains, fever, and malaise. The affection is curable under iodid treatment in moderate dosage.

SPOTTED FEVER.—See CEREBROSPINAL FEVER; TICK FEVER.

SPRAINS.—A sprain is always the result of indirect violence, and is produced when the movements of a joint are carried beyond their physiologic limits, but stop short of a permanent displacement of the articular ends—that is, dislocation. A sprain may be said, therefore, to be the aborted stage of a dislocation. Extensive muscular action may likewise produce a sprain. In many individuals the first injury predisposes to the recurrence of the condition from apparently trivial causes. In the majority of sprains there is a stretching of the capsule of the joint and of one or more ligaments. In severe cases there is a rupture of one or both of these, with consequent laceration of blood-vessels, and often of nerves. Hemorrhage into the joint and the periarticular structure is always present. The ligaments, as a rule, if torn, give way at the point of insertion rather than in their continuity. This is made manifest in milder cases by tenderness at some point above or below the articular line, and corresponding to the point from which the ligament was torn. In the tearing of a ligament from its osseous attachment particles of bone are not infrequently brought away with the detached fibrous structure. In severe cases the bone may be denuded of its periosteum for a considerable distance. In the sprains of childhood and adolescence this condition is not uncommon, owing to the great flexibility of the bone. In adults, on the other hand, the extreme limit of the sprain is the tearing away of a greater or less fragment of bone to which the ligament placed upon the stretch by the trauma has been attached. It is in this way that fractures of the lower end of the radius and of the lower end of the fibula may be considered as severe forms of joint distortion. They are sometimes known as sprain-fractures. In severe sprains the segment of the capsule opposite that which is put upon the stretch may be pinched between the articular surfaces. Thus, in severe sprains of the ankle pain is often felt on both sides of the foot. In very severe cases a rupture of the muscles of the accompanying joints may ensue. This is quite uncommon. When it results, the muscles give way along the line of attachment to the tendon.

The symptoms of a sprain are pain, swelling, ecchymosis, and limitation of joint function. The pain at the moment of accident it often very severe, leading at times to syncope. When an examination of the joint is made, the tenderness will be found most marked over the articular line and over the insertion of the ruptured ligament. The swelling varies greatly in different cases, since it depends upon the hemorrhage within and about the joint. In mild cases it is limited to the periarticular structures, appearing in the form of ecchymoses within the course of two or three days. The ecchymoses, owing to ruptures of muscles, are often found at points considerably removed from the affected joint. The ecchymosis following a sprain is often found at a distance far removed from the joint without rupture of muscle. Often the only ecchymoses seen in sprains of the shoulder appear after the lapse, sometimes, of many days at the point of insertion of the deltoid. As a rule, the swelling attains its maximum within the course of 24 hours. In many cases, however, the hemorrhage into the joint produces a reactional hydrarthrosis, which reaches its maximum in from a week to 10 days. The degree of periarticular or intraarticular swelling depends entirely upon the extent of damage done to the ligaments and the joint capsule.

The frequency with which joints are subject to sprain varies with their nature. The enarthrodial joints, in which the range of movement is widest, are least subject to sprains. On the other hand, joints of the hinge variety are more frequently the seat of such lesions. Sprains occur, therefore, most often in the ankle, the knee, the wrist, and the small joints of the hand.

The clinical history of a sprain varies with the conditions produced by it. In some cases characterized by the stretching of the ligaments without laceration, the pain and swelling speedily subside, and after a few days or a week the joint functions are restored. In severer cases when hemorrhage into the joint and periarticular swelling indicate extensive laceration, the progress toward recovery is often very tedious, and months may pass before a final restitution to the normal condition takes place. In the severest cases circumscribed tender areas, thickening of the joint capsules, or chronic hydrarthrosis may leave the joint permanently impaired. Atrophy of the muscles is often found to follow upon severe sprain during the first 2 weeks, and is the result of the injury to the articular nerve filaments. This condition is often irreparable.

Extensive hemorrhage into a joint is always significant of a tedious recovery, and frequently renders unfavorable the prognosis, so far as complete restoration of joint function is concerned. In subjects with a tendency to diathetic, and particularly to tubercular, disease, a sprain is often the exciting cause of chronic joint-disease.

Treatment.—In the treatment of sprains absolute rest should at once be secured. Elevation and suspension of the affected limb at a right angle will often relieve the pain at once. This position conduces to the arrest of hemorrhage and, by rapidly depleting the veins, facilitates the absorption of the already effused blood. To further hasten absorption, compression by an elastic bandage may be considered as of prime importance in the treatment of sprains. Cold applications are often of value for the relief of pain. To these may be added the lead and opium wash, or a solution of chlorid of ammonium and opium, or an ichthyol ointment. Internal administration of opiates may become necessary when pain cannot be otherwise alleviated. To secure absolute rest, immobilization of the joint by means of plaster-of-Paris, starch, or silicate of sodium bandages is often indicated. In milder cases strapping the joint with strips of adhesive plaster is often of great value. In sprains of the ankle incasing the joint by well-applied adhesive strips permits the patient to walk within 24 hours. The indiscriminate use of fixed dressings must, however, be condemned, since their unnecessarily prolonged use may lead to irremediable stiffness of the joint. It is preferable to resort to the use of splints, which can be removed daily if required. After the subsidence of the acute symptoms of the sprain, the main object of treatment must be that of the restoration of joint function. Efforts in this direction should never be delayed beyond the second week. The chief agents in attaining this end are passive movements and massage methodically applied. In the severest forms of sprains, in which the intraarticular effusion is not absorbed by this treatment, recourse must be had to aspiration of the joint.

In sprains that are not relieved by one or other of these methods of treatment, singly or combined, counterirritation by means of blisters, or, preferably by ignipuncture, often answers admirably. When there is any thickening under an especially tender point, recourse should be had to free incision. In a few cases hemorrhagic cysts have been drained or granulation masses removed with a curette, thereby permanently relieving the symptoms. Such a subfascial cyst as large as a hazelnut has been successfully drained. It was over the trochanter, and directly under a point that had been extremely tender during two years following a sprain of the hip. See JOINTS (Injuries); ANKLE.

SPRUE (Psilosis).—A tropical disease, characterized by stomatitis, chronic gastrointestinal catarrh, and atrophy of the liver. Emaciation, tympanites and diarrhea are markedly prominent symptoms. The treatment is chiefly tonic and dietetic. Rest in bed and an exclusive milk diet should be insisted upon until there is a decided abeyance of the symptoms, then a very gradual return to normal diet. An exclusive meat and beef juice diet is advocated by some clinicians, while others recommend a diet of strawberries.

SPUTUM.—The material discharged from the alveoli of the lungs, bronchi, trachea, larynx, pharynx, and posterior nares.

Characteristics.—The **amount** of sputum varies both in health and in disease. In certain affections of the lungs, as edema, gangrene, and tuberculosis, the sputum is always increased in amount.

Consistence.—In certain affections, as in early stages of croupous pneumonia, it may be so thick or viscid that in inverting the receptacle into which it is discharged the fluid may not escape.

The **color** varies greatly under different circumstances, being at times reddish (pneumonia and pleurisy), greenish (edema and gangrene), blackish (in coal-miners), blood-tinged (phthisis).

Normally, the **odor** is only faintly perceptible, but in putrefactive processes the odor is strong and frequently nauseating.

The **specific gravity** ranges from 1.015 to 1.026.

Configuration or Character.—(1) Mucoid, (2) purulent, (3) serous, and (4) sanguineous. There may be combinations of these, such as mucopurulent, mucoserous, serosanguineous, sanguinomucopurulent, nummular, etc.

Clinical Significance.—In health the sputum is a transparent, colorless, slightly glutinous liquid, like thin mucilage. It contains mucin, varying quantities of saline matter, and water. The saline matter is abundant in transparent viscid expectoration, deficient in the opaque and less tenacious kind, and least in the actually purulent sputum.

The quantity and viscidity of ordinary mucous secretion is increased in simple catarrhal inflammation of the bronchial membrane. A change occurs when bronchitis has existed for some days, the secretion becoming semitransparent and then opaque, the color changing to a yellow or greenish hue.

The sputum becomes frothy from admixture of air, rusty or prune-juice colored from oozing from the capillary vessels. Fibrinous molds of the bronchial tubes, chalky masses consisting of inspissated and calcified cheesy matter, are sometimes expectorated.

A person having chest complaint, coughing frequently, and expectorating a frothy salivary fluid only may have pleurisy. If the expectoration is glairy, like white of egg, bronchitis may exist. A rusty tinge, like thick gum-water colored with blood, indicates pneumonia. A sudden gush of fetid pus points to abscess or empyema. Purulent expectoration occurs in bronchitis as well as in phthisis, but when long-continued and accompanied by a distinct rhonchus, it invariably comes from a vomica.

In phthisis the expectoration is usually salivary or frothy at first, the result of irritation. Later it becomes viscous, and subsequently dotted and streaked with blood. A pearly aspect next ensues, with whitish opaque spots. These become large, flocculent, and ultimately nummular. Later the expectoration becomes purulent, and just before death is surrounded with a pinkish halo. By the addition of acetic acid, the sputum may be made transparent, and elastic tissue more clearly seen. The experienced eye is the best guide in the selection of those small pinhead-sized flocculi of expectoration in which microscopic particles of lung tissue may be detected.

The existence of carcinoma of the lung may sometimes be detected by the microscope, and from the character of cells found, the same apparatus may indicate the part of the respiratory tract affected and the degree of disease existing.

Treatment may be much guided by a study of the expectoration. An alteration in the nature of the secretion may affect the symptoms, and relieve the cough and dyspnea. If frothy from congestive disorder, warm poultices, turpentine stupes, or hot flannels externally may benefit, while fever may be reduced and irritability lessened by giving salines with antimony or aconite. Lemon-juice, liquor potassæ, and various inhalations give relief if there is a viscid or glutinous expectoration. Iodid of potassium, given with a few drops of wine of antimony, will promote cell and tissue change, and make the secretion less adhesive.

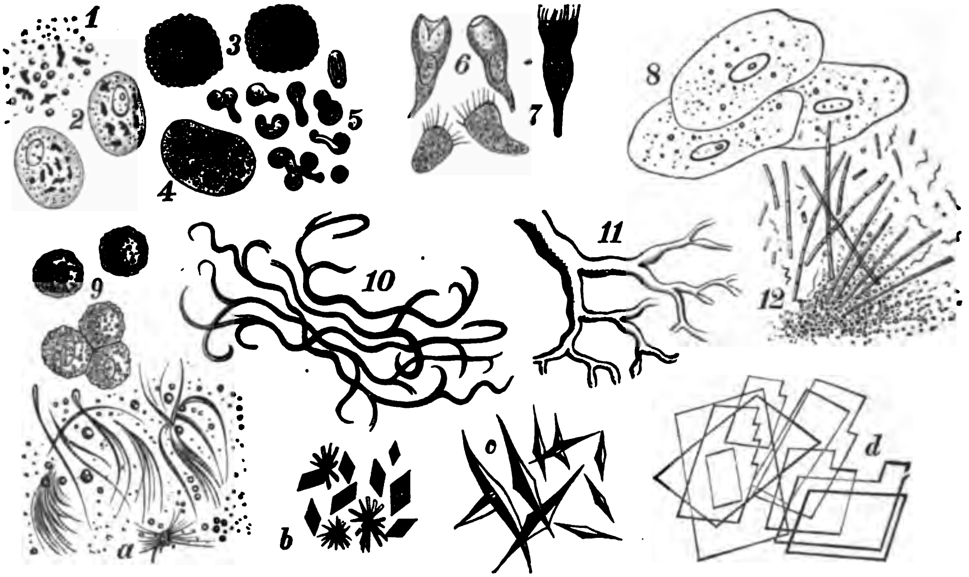
Senega and the gum-resins are indicated when mucopurulent secretion is established. In the form of a lozenge they may be continually used. Benzoin, tolu, and copaiba are of use Acetic or tannic acid, given in small or frequently repeated doses, reduces the quantity of secretion. Calomel with antimony and guaiac, as in Plummer's pill, is of the greatest service, and calls for much discrimination and care. Inhalation of tar, creosote, or oil of juniper are of benefit to the affected surface of the mucous membranes, while cod-liver oil, iron, and tonics improve the general health.

Macroscopic appearance may present (1) elastic tissue or threads; (2) fibrinous casts, as in pneumonia or certain varieties of bronchitis, diphtheria, etc., Curschmann's spirals, and Charcot-Leyden crystals (see ASTHMA); (3) Dittrich's plugs —yellowish-white or grayish malodorous masses of bacteria, fatty acid crystals and pus found in pulmonary gangrene, follicular tonsillitis, etc.; (4) echinococcus membranes; (5) various concretions or calcareous plugs (broncholiths and lung stones); (6) foreign bodies.

Microscopic Appearance.—The specimen is spread on a glass slide, a cover-glass superimposed, and immediately examined. It may show (1) leukocytes; (2) red blood-cells; (3) epithelial cells; (4) elastic tissue; (5) animal parasites, as echinococcus hooklets; (6) various bacteria.

The chief **bacteria** are tubercle bacillus, pneumococcus, influenza bacillus, actinomycosis, oidium albicans, and aspergillus mycelium. See TUBERCULOSIS.

Crystals in Sputum.—(1) Charcot-Leyden; (2) hematoidin; (3) cholesterin, as in phthisis; (4) fatty acid crystals; (5) tyrosin crystals; (6) crystals of oxalate of calcium and triple phosphate.



OBJECTS FOUND IN THE SPUTUM.—(*Landois.*)

1. Detritus and dust-particles. 2. Pigmented alveolar epithelium. 3. Fatty degenerated and partially pigmented alveolar epithelium. 4. Alveolar epithelium showing myelin degeneration. 5. Free myelin forms. 6, 7. Desquamated ciliated epithelium, partly changed and deprived of its cilia. 8. Squamous epithelium from the mouth. 9. Leukocytes. 10. Elastic fibers. 11. Fibrinous cast of a small bronchus. 12. Leptothrix buccalis, together with cocci, bacilli, and spirochetæ. *a.* Fatty acid crystals and free fatty granules. *b.* Hematoidin. *c.* Charcot's crystals. *d.* Cholesterin.

Chemically the sputum contains (1) albumins, (2) volatile fatty acids, (3) glycogen, (4) ferments, and (5) inorganic salts.

After examination of the unstained specimen a smear should be made; the preparation should next be dried in the air and stained with Wright's stain for 3 minutes, washed and mounted.

Pathologic Technic.—The following are the principal methods of procuring a concentrated sediment for microscopic examination:

Biedert's Method.—Used in examining sputum that contains few tubercle bacilli. Mix 15 c.c. of the sputum with from 75 to 100 c.c. of water and a few drops of potassium or sodium hydroxid solution. Boil until the sputum is thin. Place in a conic glass vessel, and after two days pour off the supernatant liquid. Stain the precipitated sediment.

Kaatzer's Method.—Mix the sputum with from a 1 to a 3 percent solution of caustic soda or potash. This dissolves the cells and mucus, but preserves the elastic fibers and bacteria. Stain the sediment. Clear the preparation with a dilute solution of acetic acid.

Kühne's Method.—This method is used to overcome the viscidity of sputum and to facilitate the spreading of a thin and even film on the cover-glass. It consists of adding to the sputum an equal volume of a saturated solution of borax. A concentrated aqueous solution of ammonium carbonate will reduce the consistency of less viscid sputum.

Mühlhäusen's Method.—This method is used to render the sputum less viscid. It consists in adding to the sputum from 6 to 8 times its volume of a 2 percent solution of caustic potash.

The resulting mixture may then be centrifuged and examined.

Preserving Sputum. *Savelieff's Method.*—This is a process of preserving sputum for purposes of subsequent examination. Let the patient expectorate in a receptacle containing 95 percent alcohol, in which the sputum may remain for several months, and in which it is hardened by dehydration and coagulation. A few drops of caustic potash solution added to a small lump of the hardened sputum on a slide will liquefy it in a few minutes, and from this the cover-glass preparations are made. When dry, fix the film by passing the cover-glass twice through the flame of a spirit-lamp, wash in water to remove the potash, and then stain according to any of the given methods.

Sectioning Sputum. *Gabritschewsky's Method.*—Place the denser portions of freshly expectorated sputum in Müller's fluid, or some other hardening reagent, and then embed in celloidin. Stain the sections in safranin, alum carmin or hematoxylin eosin. Aronson and Philip treat the sputum first with corrosive sublimate, and, according to Schmidt, it may be embedded in paraffin as well as celloidin.

SQUILL (Scilla).—The sliced dried bulb of *Urginea maritima.* It contains the glucosids—*scillitoxin,* acrid and bitter, the most active principle; *scillipicrin,* acting on the heart; and *scillin,* causing numbness and vomiting; also *sinistrin,* a mucilaginous principle. The *scillitin* of the older writers is a complex substance. Dose of the powdered drug, 1 to 5 grains.

In small doses squill is expectorant, in larger doses emetic and diuretic, and in overdoses it is a violent irritant poison, producing nausea, vomiting, purging, gastroenteritis, strangury, bloody urine, perhaps suppression of urine, paralysis and convulsions, with death by paralysis of the heart in systole. Medicinal doses slow the heart, making the pulse stronger and slower, raising the arterial tension, and increasing the flow of urine (like digitalis). Its active constituents diffuse into the blood, and its systemic effects follow on its application to the skin and seem to be exerted upon the lining of the secretory organs, especially affecting the bronchial, gastrointestinal and genitourinary mucous membranes.

Squill is employed in medicine for its expectorant and diuretic effects. It is especially applicable in cardiac dropsy, combined with digitalis or the saline diuretics, and in chronic bronchitis, in which it may be associated with ipecac, ammonia, asafetida, or benzoin. It is used in croup, but is usually combined in this affection with some other emetic, as tartar emetic in the compound syrup, a mixture which may produce very depressing effects and should be used with caution. In whooping-cough and other irritant coughs with tickling sensations in the throat the syrup or vinegar is often of great service.

In dropsy:

℞.	Powdered squill,	gr. x
	Powdered digitalis leaves,	gr. xx.

Make into 10 pills. Give 1 pill after meals.

In subacute bronchitis:

℞.	Wine of ipecacuanha,	ʒ j
	Tincture of squill,	ʒ ij
	Syrup of tolu,	ʒ v
	Water,	℥ j.

Give a teaspoonful every 3 or 4 hours.

Preparations.—**S., Acetum,** "vinegar of squill," 10 percent in strength. Dose, 5 to 30 minims. **S. Flext.** Dose, 1 to 5 minims. **S., Syr.,** has of vinegar of squill 45, sugar 80, water sufficient quantity. Dose, 10 to 60 minims. **S., Syr., Comp.,** fluidextract of squill and fluidextract of senega, each 80, tartar emetic 2, sugar 750, water to 1000. Dose, 10 minims to 1 dram, for children as an emetic; 20 to 45 minims, for adults as an expectorant. Commonly known as Coxe's Hive Mixture. **S., Tinct.,** 10 percent. Dose, 5 to 30 minims.

SQUINT.—See EYE-MUSCLES (Strabismus).

STAINING.—See PATHOLOGIC TECHNIC.

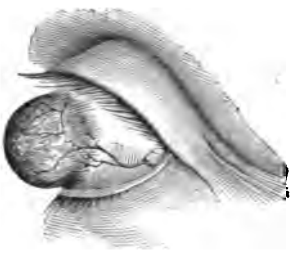
STAMMERING.—See SPEECH DEFECTS.

STAPHISAGRIA (Stavesacre).—The ripe seed of *Delphinium staphisagria.* Its properties are due to an alkaloid, delphinin, and other extractives. Dose, 1/2 to 2 grains. It is a violent emetic, cathartic, and parasiticide. It lowers the activity of the heart, producing adynamia. It is used internally in asthma and rheumatism, and externally for itch and lice. **S. Fluidextract,**

Dose, 1/2 to 2 minims. **S. Ung.**, unof., 1 part of powdered seeds with 2 each of olive oil and lard. **Delphinin**, unof. Dose 1/12 to 1/4 grain.

STAPHYLOCOCCUS.—See Suppuration; Vaccine Therapy.

STAPHYLOMA OF THE CORNEA.—A bulging forward of a corneal scar with an adherent iris. It is caused by the weakening of the corneal tissue, which gives way to the intraocular pressure, pushing the iris and even the lens forward. Secondary glaucoma is not an uncommon complication. The staphyloma may be partial or total. The pain, loss of vision, and repulsive disfigurement associated with this affection render the patient a great sufferer.



Complete Staphyloma.

Treatment.—Unless the condition is only that of a simple prolapse of the iris, the treatment is of no avail. When possible, abscission of the staphylomatous projection, forming a suitable stump for a glass eye, is to be preferred to enucleation, particularly in young children, in whom the presence of orbital contents is necessary for the symmetric growth of the face. If there are signs of infection or internal disease, enucleation is peremptorily demanded.

STAPHYLORRHAPHY.—See Cleft Palate.

STARVATION.—See Fasting.

STATUS EPILEPTICUS.—See Epilepsy.

STATUS LYMPHATICUS (Lymphatism).—A hyperplasia of the thymus, spleen, lymphatic glands and lymph tissues, including bone marrow, occurring usually in children. It is associated with a marked tendency to sudden death, either without tangible cause or subsequent to operation, anesthesia or antitoxin administration. The patient is anemic and the tonsils and thyroid are usually enlarged. In several cases a section of the enlarged thymus has been excised. There may be hyperplasia of the heart and aorta, and rickets.

STENOCARDIA.—See Angina Pectoris.

STERILITY.—In considering the causes of sterility it should be remembered that the husband is at fault in about 30 percent of all sterile marriages. Bilateral epididymitis is a potent factor in male sterility. Imperfect development of the sexual organs is an important cause of sterility in women. The ovaries may be undeveloped, in which case ovulation is imperfect or absent; the uterus may be very small, or the vagina may be so narrow that complete sexual intercourse is impossible. Obstruction in some part of the genital tract may cause sterility. All cases of atresia of the vagina, cervix, or fallopian tubes would come under this class. The two former conditions are usually congenital, the latter is usually the result of inflammation. Tumors and polypi may act as sources of obstruction, as may also displacements of the uterus. Chronic inflammatory conditions of the tubes and ovaries, uterus, and vagina are frequent causes of sterility. Inflammation of the ovary may prevent ovulation by destroying the glandular substance, or by causing thickening of the capsule, which prevents rupture of the follicle and escape of the ovum. Inflammation of the uterine and vaginal mucous membrane causes sterility mainly on account of the leukorrheal discharge that accompanies it. This is particularly true of inflammation due to gonorrhea. Cancer of the cervix obstructs the cervical canal, and at the same time produces a profuse leukorrhea.

The treatment will, of course, consist in eliminating the cause whenever this is possible. If the condition is due to errors in development, little or no hope of cure can be entertained. Atresia or congenital narrowness of the cervix or vagina may be treated by incisions or dilatation. If displaced, the uterus must be replaced. Tumors and polypi require removal.

Inflammatory conditions require appropriate treatment. If the tubes and ovaries are affected, little good can be accomplished; if the inflammation is confined to the uterus and vagina, treatment is very effective. In a certain small percentage of sterile marriages the sterility is undoubtedly the result of incompatibility. These cases are usually not benefited by treatment.

STERILIZATION.—The condition of rendering sterile, infertile, or incapable of reproducing. In bacteriology the destruction by heat of the spores or mature forms of bacilli, micrococci, or other forms of microscopic life. In most instances a temperature of 100° C. (212° F.) devitalizes not only the mature forms, but the spores as well. The methods of sterilization of instruments, dressings, ligatures, etc., are fully discussed under Abdominal Section (*q. v.*). See also Disinfection, Milk (Sterilized).

STERNUM, INJURIES.—Fracture of the sternum is exceedingly rare, except when there exists injury to other bones connected with it. The fracture may be transverse, oblique, or longitudinal. Such injury with dislocation (most usual at the junction of the manubrium with the gladiolus), is often complicated by laceration of the pleura, pericardium, or other injury to the lung. Attempts at reduction are most difficult, although it has been accomplished by manipulation in a few cases. The prognosis in uncomplicated fracture or dislocation of the sternum is favorable. In complicated cases the mortality is high.

Treatment.—When overriding exists, reduction may be obtained by bending back the body over a firm pillow, and then ordering deep respiration; or reduction may be affected under ether. When corrected, the deformity tends to recur, and the bones often unite in faulty position, with no disastrous sequels. Fragments should not be cut down upon or hooked up unless complications are present. After reduction, adhesive strips may be placed laterally, extending down from the axillary line and running vertically from well above the seat of fracture to the ensiform cartilage. An anterior figure-of-eight bandage may envelop the breast. A circular bandage of the chest, a posterior figure-of-eight, holding back the shoulders, may suffice. A large compress held by adhesive plaster and a broad tight roller may be employed. The erect or semierect position in bed favors easy respiration, and antagonizes the tendency to displacement. When the ensiform cartilage is bent in so as to cause great pain or to injure the stomach, it should be excised.

STERNUTATORIES.—See Errhines.

STERTOR.—The noisy breathing of a person in a state of coma. There exists a paralytic condition of the muscles of the lips, cheeks, tongue, fauces, and soft palate. The latter becomes a flaccid curtain moving to-and-fro with respiration—a similar movement occurring in the cheeks and lips. The tongue falls toward the pharynx, mucus collects in the mouth, and, becoming mixed with air, appears frothy at the mouth. As a result of these conditions, there is a snorting noise.

STETHOSCOPE.—An instrument for ascertaining the condition of the organs of circulation and respiration by their sounds. It consists of a hollow tube, one end being placed over the locality to be examined, the other at the ear of the examiner. A binaural form of the instrument consists of a Y-shaped tube—the flexible branches being applied each to an ear of the listener. By this means not only are all extraneous sounds shut out, but an intensified sound is conveyed to the ear. The Phonendoscope (*q. v.*) is a recent modification. See also Chest (Examination).

STILLINGIA (Queen's-root).—The root of *S. sylvatica*, or "queen's-delight." Its active principle is not known. It is expectorant, diuretic, and sialagog, with reputed alterative properties; in larger doses, emetic and cathartic. It is used with sarsaparilla as an antisyphilitic in the tertiary stage. It is valuable with quinin in intermittent fever. Dose of the powdered root, 10 grains to 1 dram; of the fluidextract, 10 minims to 1 dram.

STIMULANTS.—A term which is used in various senses when applied to medicinal agents. Alcoholic preparations, which are true narcotics, are commonly termed "stimulants," and the same expression is employed to designate any agent which excites even briefly the organic action of any part of the system. All excessive stimulation reacts into depression, and most of the agents which stimulate the nerve centers at first will soon depress and finally paralyze them. In many cases the action is one of progressive stimulation primarily and progressive paralysis afterward, affecting the centers in the inverse order of their development, the highest or latest developed centers being affected first, the lowest or oldest ones last. These laws are well exemplified in the action of Alcohol (*q. v.*) upon the nervous system. *Diffusible Stimulants* are those which have a prompt but transient effect on the general system, such as alcohol, ammonia, camphor. *Spinal Stimulants* exalt the functions of the cord, as strychnin, picrotoxin, ergot, atropin, phosphorus. *Cardiac Stimulants* increase the action of the heart, as alcohol, adrenalin, strychnin, atropin, and morphin in small doses; also squill, convallaria, cimicifuga and digitalis, which slow but strengthen the cardiac action. *Respiratory Stimulants* directly stimulate the respiratory center, as ammonia, strychnin, apomorphin, belladonna. *Vascular Stimulants*, as alcohol, chloroform, ether (all three in very small quantities), adrenalin, ammonia, strychnin, digitalis, and squill, acting on the vasomotor center; and the nitrites, belladonna, electricity, volatile oils, acting as local dilators of the vascular system. *Cerebral Stimulants*, as alcohol, opium, belladonna, caffein, cocain, cannabis, chloroform, ether, tobacco. *Renal Stimulants*, as the diuretic group. *Stomachic Stimulants*, as the aromatics, volatile oils, vegetable bitters, mineral acids, nux vomica, mustard, capsicum. *Hepatic Stimulants*, as nitromuriatic and nitric acids, and the cholagog purgatives podophyllum, jalap, leptandra, euonymin, iridin. *Intestinal Stimulants*, as mercurials, elaterium, colocynth, jalap, scammony, podophyllum, which affect the glandular apparatus—and belladonna, physostigma, nux vomica, rhubarb, senna, aloes, frangula, cascara, which chiefly affect the muscular fibers and the intestinal nerves. *Cutaneous Stimulants*, as the diaphoretic group, and the rubefacients, mustard, capsicum, turpentine, ammonia. *Local Stimulants* increase common sensibility to the extent of producing pain, chiefly by direct action upon the end-organs of the sensory nerves in the skin, though some act probably by stimulating the local circulation, as in inflammation. The principal members of this sub-division are: heat, cold, faradism, alcohol, ether, chloroform, phenol, creosote, ammonia, mineral acids, volatile oils, acrid essential oils, metallic salts, veratrin (at first), cantharis (at first).

STINGS.—See Bites and Stings.

STOKES-ADAMS SYNDROME.—See Heart Block.

STOMACH, CANCER. Varieties.—(1) Hard cancer (scirrhus); (2) colloid cancer; (3) soft cancer (medullary); (4) epithelioma.

Etiology.—(1) Heredity, (2) adult life, (3) male sex, and (4) ulcer of the stomach are the most common etiologic factors.

Pathology.—Cancer of the stomach is generally a primary affection, and next to cancer of the uterus is the most frequent seat of this disease. It is generally situated at the lesser curvature and pyloric end of the stomach. The medullary variety is very prone to undergo ulceration. In many cases cancer of this organ may be secondary to the disease elsewhere.

Symptoms and Clinical Course.—There are no characteristic symptoms in the early stages. Later it presents the following: Constant and localized pain; dyspeptic manifestations; constipation; rapid emaciation; cachexia; moderate anemia and leukocytosis; hematemesis, causing vomiting of a "coffee-ground" material long after eating; absence of free hydrochloric acid in the gastric contents one hour after a test-breakfast; and the presence of a tumor in the epigastrium.

Diagnosis.—(See also Gastritis (Chronic)).

CANCER OF THE STOMACH.	TUMOR OF THE LIVER.	TUMOR OF THE SPLEEN.	CANCER OF THE PANCREAS.	TUMOR OF THE COLON.
1. Tumor nearly always present in region of pylorus (epigastric region).	1. Tumor usually in right hypochondriac region.	1. Gastric cancers seldom present in area of spleen. History of malaria or symptoms of leukemia.	1. Tumor in region of epigastrium.	1. Tumor in umbilical region.
2. Tumor hard, uneven, and tender.	2. Tumor hard, uneven, or nodular and tender.	2. Tumor hard, usually smooth.	2. Tumor hard, nodular, and tender.	2. Tumor may be hard or soft.
3. Tumor slightly movable.	3. Usually movable. If carcinoma, immovable.	3. Tumor immovable...	3. Tumor immovable...	3. Tumor movable.
4. Dulness on percussion.	4. Increased area of dulness in right hypochondriac region.	4. Increased area of dulness in left hypochondriac region.	4. Increased area of dulness when stomach is collapsed.	4. Increased area of dulness, and separable from the stomach.

Prognosis.—The disease is inevitably fatal. The duration is from 1 to 3 years.

Prophylaxis.—Since chronic ulceration has been found to be one of the most frequent causes of cancer of the stomach, early excision of gastric ulcers is advisable.

Treatment is merely palliative. If the stomach is intolerant of food, resort must be had to rectal alimentation, and the best that can be hoped for is to prolong life, which can only be one of suffering.

Any formula for rectal alimentation may be used. See STOMACH (Ulcer).

Peptonized milk may also be given. It may be made as follows: Extract of pancreas (5 grains), sodium bicarbonate (15 grains), and a cupful of water; to this add a pint of milk. Heat for 10 minutes at a temperature of 100° F.

℞. Pepsin, ʒ j
Dilute hydrochloric acid, ʒ jss
Syrup, ʒ iij
Water, add enough to make, ℥ ij.
Teaspoonful after meals.

℞. Strychnin sulphate, gr. ss
Solution of iron and ammonium acetate, ℥ vj.
Two teaspoonfuls after meals.

For the pain, morphin (1/4 grain) may be given hypodermically. For the indigestion and similar symptoms, see GASTRITIS (Chronic).

The operative treatment is discussed under STOMACH (Surgery).

STOMACH, CATARRH.—See GASTRITIS.

STOMACH, DILATATION.—A permanent increase in the capacity of the stomach, due to atony or pyloric obstruction.

Synonyms.—Gastrectasia; gastric atony; myasthenia.

Etiology.—(1) Overeating; (2) beer drinking; (3) rapid fermentation of gastric contents; (4) certain diseases—heart-disease, tumors (cancer) of pylorus, typhoid fever, tuberculosis, tabes dorsalis; (5) it may be secondary to chronic gastritis.

Pathology.—The muscular coats of the stomach are much thinner than normal, and the mucous membrane is in a state of atrophy. There are evidences of hyperplasia of connective tissue of the muscular coat in certain areas. The capacity of the stomach may be equal to 6 pints of fluid.

Symptoms and Clinical Course.—There is a sense of fulness in the epigastrium, which may be visibly distended; eructation of gas, copious vomiting of liquid material, containing small particles of food and having a very sour odor, are also prominent signs. The appetite is lost, the tongue is coated, the bowels are constipated, and the urine is high colored and scanty. Emaciation and anemia may be quite marked.

Physical Signs.—**Inspection** may detect the outline of the organ, which distends the abdominal walls. In cases of complete obstruction of the pylorus the peristaltic wave can be traced.

Palpation confirms inspection.

Percussion.—The patient is placed in a standing position; percussion should be made from the lower border of the ribs in the midsternal line downward. A tympanitic note will be detected over the upper area of the stomach, and dulness over the base of the organ on account of the fluid contents gravitating to this position as the patient stands erect. Immediately below this dulness tympany again begins, due to the position of the bowel. If the patient assumes a horizontal position, the contents of the stomach gravitate posteriorly, and tympany will exist where dulness was previously found.

Should the area of the stomach be shown to be below the navel, the organ is considered to be in a state of dilatation. It it is desired to confirm the diagnosis, the organ may be dilated artifically: give tartaric acid (1 dram) dissolved in water (2 ounces), and subsequently sodium bicarbonate (1 1/2 drams) in the same quantity of water. Malignant disease must first be excluded.

Diagnosis depends upon the symptoms and physical signs.

Prognosis.—If due to malignant growth, the prognosis is unfavorable. If due to simple atony, relief may be obtained.

Treatment.—The first indication is removal of the cause if possible. The patient must accustom himself to smaller quantities of food at each meal. A quart of liquid may be allowed in the 24 hours.

Constipation must be treated on general principles: first by correcting the diet, then by giving salines—Epsom salt (2 drams) or Rochelle salt (2 drams)—before breakfast. Fluidextract of cascara (1/2 dram) with an equal quantity of glycerin may be given at bedtime. Lavage of the stomach may be practised every 2 days. See Lavage.

℞. Strychnin sulphate, gr. 1/4
Dilute hydrochloric acid, Pepsin, } each, ʒ j
Syrup, ʒ iij
Water, add enough to make, ℥ iij.
Two teaspoonfuls after meals.

℞. Creosote, ʒ j
Compound tincture of cardamom, add enough to make ℥ iij.
Teaspoonful half-hour after meals.

STOMACH, EXAMINATION.—The patient should be in the recumbent posture in a strong light.

Inspection detects the outline in very thin persons, and sometimes the peristaltic wave and the presence of tumors.

Palpation.—The hand should be placed flat upon the abdomen, the fingers making gradual pressure, at the same time having a rotatory movement. By this method are detected epigastric pulsation, as in cardiac disease, anemia, aneurysm of aorta, the shape and position of epigastric tumors, and localized pain.

Percussion yields a tympanitic note by which may be detected the correct outline. The upper and right lateral boundary extends along the lower border of the right lobe of the liver; the left lateral boundary to the inner border of the spleen. The stomach has no fixed position, as it is very movable. To determine the lower boundary, percussion should begin in the region of the umbilicus, gradually going upward until an impaired resonance is elicited.

The stomach may be *increased in size* by (1) gaseous distention, (2) large quantity of liquid or food, or (3) tumors.

The stomach is *displaced downward* in (1) emphysema, (2) left pleural adhesion, (3) enlargement of the liver or spleen, (4) tight lacing, or (5) deep inspiration.

The stomach is *displaced upward* in (1) tympanites, (2) ascites, (3) tumors, or (4) during the latter months of pregnancy.

The correct outline of the stomach may be obtained by making separate solutions of sodium bicarbonate (1 1/2 drams) and tartaric acid (1 dram), each in half a glass of water. The tartaric acid solution should be given first, followed immediately by the sodium bicarbonate. Malignant disease should always be excluded before causing rapid dilatation of the stomach.

Auscultation detects (1) the normal deglutition murmur, and (2) obstruction at the cardiac orifice of the stomach.

1. To obtain the normal deglutition murmur, place the stethoscope over the esophagus and just below the xiphoid cartilage, and allow the patient to drink a small quantity of water. The first murmur in health occurs immediately, and is hissing or spurting in character. Within from 5 to 7 seconds the second sound is heard; it is due to the escape of the water from the esophagus into the cardiac end of the stomach, and has a gurgling, sprinkling, or splashing sound.

2. When there is obstruction at the cardiac orifice of the stomach, the second is delayed in some instances for over a minute. See Stomach-contents.

STOMACH, INJURIES. Rupture.—Traumatism seldom causes a laceration except when the stomach is overdistended with liquid or semiliquid material. It may be severely injured through contusion of the abdominal wall, in which case the rent is found near the pyloric orifice. Laceration of the mucous membrane has been found resulting from lavage of the stomach. In the case of incomplete tears there are hematemesis and severe localized pain, resembling gastric ulcer in its gnawing character, together with symptoms of shock. If the wound of the organ is large, and there is a great extravasation of the stomach-contents, a general peritonitis is produced. If, on the contrary, the wound is small, there is a tendency to form adhesions whereby the inflammatory area will be isolated from the general peritoneal cavity.

Treatment.—Whenever the stomach is perforated, the indication is to explore the parts after abdominal section, and remove all infection that may have taken place in the peritoneal cavity by the extravasation of the intestinal contents. The wound in the stomach is then sewed by means of Lembert sutures, and is closed according to the general rules of antiseptic surgery.

Foreign Bodies.—These generally consist of such substances as have been swallowed accidentally, or of concretion from the constant ingestion of such substances as hair and wool, which finally agglutinate into a mass. The only treatment for such a condition is to open the organ (gastrotomy) and remove the mass; if, however, the foreign body is of small dimensions, such as a coin, it may safely be allowed to pass onward. See Stomach (Surgery).

Hernia of the Stomach.—The stomach has been rarely found in inguinal hernias and still less frequently in femoral hernias. The diagnosis is not usually made until operation, and fatal results are common. Herniotomy is indicated in such cases, and the stomach should be dealt with by simple reposition or resection of a portion of its wall if damaged beyond the possibility of repair. The stomach may also prolapse in a diaphragmatic hernia.

STOMACH, NEUROSES.—See Gastric Neuroses.

STOMACH, SURGERY.—**Gastrolysis,** or loosening the stomach from adhesions, has been found necessary in a number of cases in which extensive adhesions have given rise to severe pain and decided disturbance of digestion.

Such adhesions arise most frequently as a result of gastric ulcer, but they may be caused by general peritonitis or inflammatory conditions in neighboring organs, such as the liver, gallbladder, colon, pancreas, spleen, or abdominal wall. The condition is difficult of diagnosis, as there are no distinctive symptoms, and it is seldom that the cause of the disorder has been determined before operation. The adhesions may be very broad or they may be band-like, in which case there is often danger of constriction of the bowel. Operation by celiotomy and excision of the bands or loosening the adhesions is usually followed by perfect relief. In some cases of very extensive adhesions producing stenosis of the pylorus or partial hour-glass contraction, gastroplasty, resection, or partial gastrectomy may be necessary.

Gastrotomy for the removal of foreign bodies is indicated in cases in which the nature of the foreign body is such that it either cannot pass or can only pass with great risk, or if urgent symptoms arise. More or less sharp or jagged bodies, such as pins, small knife-blades, and bits of glass, have often been well tolerated by the stomach; but in cases accompanied by serious pain and discomfort operation is imperative. Any body the size of which permits it to pass the cardia will usually pass the pylorus, but this is not true of long bodies. Aggregations of small bodies, such as masses of hair, fish-bones, or pebbles, sometimes require removal. In case severe and continued pain or distress is present, with or without nausea, vomiting, and hemorrhage, operation is demanded.

Diagnosis.—Usually the history of the case leaves no doubt as to the diagnosis, and very often the object may be felt through the abdominal wall. In children, insane persons, etc., in whom there is doubt as to the condition, the use of the X-ray will often furnish valuable information.

Gastrotomy for the relief of stricture of the esophagus may be necessary in cases in which it is impossible or undesirable to dilate by means of a bougie passed by the mouth. This is often the case if the stricture is located low down in the esophagus, particularly in cases in which the esophagus becomes dilated or pouched above the stricture. Immediate dilatation by bougies or the fingers may be practised or the stricture may be divided by Lange's specially constructed knife-blades or by Abbé's bow-string method. In such cases the stomach is immediately closed. If, however, a large portion of the esophagus is constricted and repeated dilatation is required, a temporary gastric fistula may be established. which will either close spontaneously, or may be closed at a subsequent operation.

Abbe's Bow-string Method.—A string is passed into the esophagus through the mouth, or, better, through an opening into the esophagus in the neck; then it is passed into the stomach and out through the gastric incision: the stricture is made tense by a bougie, and the string, sawed back and forth, will only divide the tense stricture and not the relaxed portion of the esophagus.

Exploratory gastrotomy has been performed in a number of cases in which no positive diagnosis could be reached by any other means; discovery has thus far followed in every case, and in most cases pathologic conditions have been found and successfully treated. The slight danger from the operation and the facility which it offers for correct diagnosis in cases of hemorrhage arising from erosions or small ulcers, symptoms due to incipient carcinoma, polypi of the mucous membrane, and other obscure conditions, makes the operation thoroughly justifiable.

Exploratory operations are strongly indicated "in cases of rapidly developing cachexia and emaciation with the symptoms of chronic gastritis and absence of HCl. Tentative treatment should not be prolonged over three weeks. It is not nearly so serious a fault to have caused the opening of a stomach and found nothing operable, as to permit a case to continue and find out at the autopsy only that it was a circumscribed carcinoma, the removal of which might have prolonged life for years." (Hemmeter.)

The Operation of Gastrotomy.—Before anesthetizing the patient for operation, it is desirable to wash out the stomach, and 8 or 10 ounces of some innocuous fluid may be left to aid in finding the stomach. The distention of the stomach by large quantities of gas, as has been suggested by some surgeons, is not without its danger of infecting the peritoneum, particularly if the stomach-wall is ulcerated, nearly perforated by a foreign body, or rendered friable by disease. If stricture of the esophagus is present, this lavage is, of course, impossible. The incision may be made parallel to the left costal margin, or, if the foreign body is large, in the median line. Before opening the stomach, it should be brought out of the abdominal cavity, if possible, and carefully examined to make certain that the stomach and not the transverse colon is being dealt with; the colon is recognized by its longitudinal muscular bands. It is then walled off with iodoform gauze to avoid contamination of the peritoneum. Stay loops may be passed through the serous and muscular coats to aid in holding the organ. The line of incision in the stomach-wall is perhaps best made parallel to the course of the vessels—that is, transversely to the curvatures—but it will depend much upon the object of the operation; after this is attained the opening is closed by Lembert's or Halsted's mattress sutures, and the abdominal wound is sutured without drainage.

Gastrostomy is the establishment by operation of a fistula through the abdominal and gastric walls, for the purpose of introducing nourishment.

Indications.—The reason for the operation exists in some insuperable obstruction in the digestive tract above the stomach, which prevents the introduction of food: to prevent death by starvation. Perhaps the most common source of obstruction is malignant disease of the esophagus or cardia; other causes are: Syphilitic stricture, diverticulum of the esophagus, congenital closure, cicatricial contraction, chemic or traumatic destruction of the walls of the esophagus, obstruction by the pressure of growths outside the esophagus, and malignant disease of the pharynx and mouth.

Epithelioma is the most common variety of malignant growth affecting the esophagus, and it occurs more frequently in males after middle life. **Fibrous stricture** is usually a sequence of ulceration caused by swallowing very hot water or caustics, or, in at least two recorded cases, as a sequel of typhoid fever. It may be due to constant traumatic irritation or injury, as sword swallowing. Benign tumors outside the esophagus, taking their origin in its walls, are rarely a cause of obstruction; this is also true ofg rowths in the neck or thorax, such as aneurysms of the aorta or innominate artery, tumors of the larynx, etc.

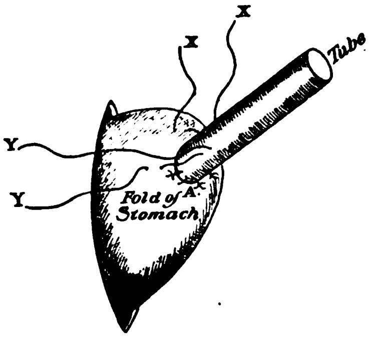
Diagnosis of Esophageal Obstruction.—The most important subjective symptom is difficulty in swallowing, which gradually increases until there is absolute inability to swallow first solid food and later food of any sort. Pain at the part affected radiating to the stomach and mouth is frequent. There may be tenderness on pressure. Food is regurgitated, in some cases mixed with mucus, pus, and blood. There is digestive disturbance, and loss of strength and weight. Objective signs are obtained by passing the esophageal bougie and by auscultation. The bougie should be soft and flexible and must be passed with great care, as deaths have been reported from the rupture of aneurysms, perforation of the pleura and of the esophagus itself, even by skilled surgeons. Considerable familiarity with the sounds of deglutition in normal and diseased conditions is necessary for satisfactory diagnosis by this means.

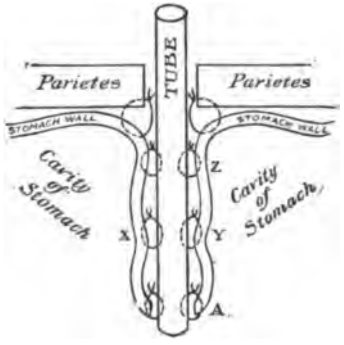
The operation of gastrostomy has been performed by various methods, the object aimed for in most of them being the avoidance of leakage of the gastric contents and subsequent excoriation of the skin, which followed the earlier operations in which the stomach was fixed to the abdominal wall and opened directly.

The operation which was devised independently by **Ssabanejew and Frank** avoids leakage and the necessity for wearing a tube, and is generally to be preferred. According to this method an incision is made along the left costal border, and the stomach is drawn out into a cone about 1 1/2 inches (3.9 cm.) long. A second incision is made an inch (2.5 cm.) above the costal border; the skin between the two incisions is undermined; the apex of the cone of the stomach, which has already been fixed by suture at the first incision, is drawn out through the second incision, passing under the bridge of skin, and is fastened by sutures. The abdominal incision is then closed, and the apex of the stomach is opened immediately. The obliquity of the canal and the pressure of the strip of skin prevent leakage, and a tube is introduced only when food is given.

Witzel's method may be used in case the stomach is so firmly contracted that it is impossible to draw out a cone sufficiently long to pass under the bridge of skin. According to this method, after opening the abdomen and walling off the field of operation with gauze, a small opening is made toward the cardiac extremity, into which a catheter (about No. 25 French), or other similar rubber tube, is introduced into the stomach; about 2 1/4 inches (5 or 6 cm.) of the protruding part of the tube are then buried in the stomach-wall by Lembert sutures; the stomach is then fixed to the abdominal wall, and the parietal incision is closed about the tube. The tube is clamped, and in rare instances it is possible, after a time, to withdraw it.

The Stamm-Kader Method.—The stomach is exposed and opened as in the Witzel operation. A rubber tube is introduced and, with catgut, the edge of the gastric wound is sutured to the tube. With celluloid hemp or silk the gastric serosa, about 1/4 inch distant from the wound, is joined to the side of the tube all around it a short distance from the wound. A second row of these serous sutures is next inserted. This causes an inversion or invagination of the stomach-wall, which serves as an efficient valve. With Lembert sutures the stomach is united around the tube to the parietal peritoneum. The outer portion of the tube is brought through the abdominal wound at a convenient point. The excess of abdominal wound is closed. The Stamm-Kader operation is the only one applicable when the stomach is much diminished in size. It is an excellent, perhaps the best, method.





In feeding by the fistula the food should at first be given in small quantities and of such a nature as to be readily absorbed. Peptonized milk or pounded beef may be administered alternately with starchy and fatty food. Later on, the quantity may be somewhat increased, as too frequent feeding irritates the stomach and the fistula. Half a pint given slowly every 4 hours is a fair average of quantity and frequency.

The mortality from the operation is about 25 percent in malignant cases, and no doubt will be much reduced as operation is resorted to earlier.

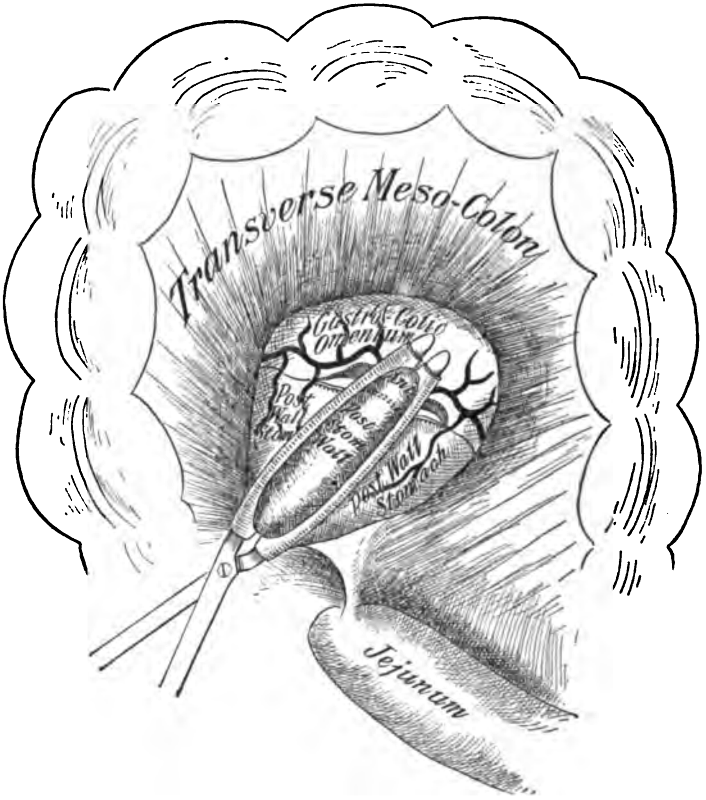
Gastroenterostomy is the operation of establishing a permanent fistula between the stomach and the upper part of the small intestine.

Indications.—The chief object of the operation is to empty the stomach quickly, particularly in cases of obstruction at the pylorus, or of ulcer and obstinate disturbance of digestion. In case of malignant disease this operation is indicated if the disease has progressed so far as to make pylorectomy or resection impracticable. In the nonmalignant forms of pyloric stenosis this operation is to be preferred only when the stenosis is extreme or the thickening is great, or in case of recurrent stenosis. The operation has also been performed with encouraging success, specially by French surgeons, in the treatment of obstinate digestive disturbances, particularly if associated with gastric ulcer.

For the symptoms and diagnosis of carcinoma and ulcer of the stomach, see STOMACH (Cancer, Ulcer).

The Operation.—It is essential that the stomach be empty at the time of operation. The practice of washing it out immediately before the anesthetic is begun, however, has been generally abandoned, as it often causes troublesome vomiting and distresses the patient. For three days prior to the operation the stomach may be washed out morning and evening, but for twelve hours before the operation the viscus should be kept at rest, all food being interdicted. In order that digestion and absorption be not interfered with, it is necessary that the upper part of the intestine be selected for anastomosis. The beginning of the jejunum is the only fixed part of the small intestine, and it can usually be found without much difficulty just below the pancreas on the left side of the vertebral column near the root of the mesentery. It is important that the upper end of the bowel shall be toward the cardiac end of the stomach, so that the peristaltic waves shall be in the same direction. Union may be effected by direct suturing or by some of the numerous buttons, bobbins, or plates that have been devised. The following points are essential, regardless of what method of operating is selected. 1. The opening must be a large one, at least 21/2 to 3 inches long. 2. The orifice must be placed at the lowest part of the stomach as the patient stands. 3. Some of the mucous membrane of the stomach and intestine should be removed in order to prevent valve formation.

Methods.—(1) Posterior gastrojejunostomy without a loop. 2. Posterior gastrojejunostomy with a loop. 3. Roux's Y method. 4. Anterior gastrojejunostomy. 5. Anterior or posterior gastrojejunostomy with enteroanastomosis. Of these methods it is probable that posterior gastrojejunostomy without a loop is most frequently applicable. If the posterior wall of the stomach is more involved by carcinoma than the anterior wall, naturally the anterior operation is preferable. Mayo states that it is to be preferred also in cases in which the mesentery is very short or contains much fat, and in those in which the vascular loop coming from the superior mesenteric artery is small so that on opening the posterior layer of the gastrocolic omentum it would be very close to the artery.



COLON AND TRANSVERSE MESO-COLON PULLED UPWARD EXPOSING JEJUNUM.—(*Binnie.*)

Exposure of stomach through rent in meso-colon. Limited separation of gastrocolic omentum and gastro-epiploic vessels from lowest point of greater curvature of stomach permits exposure of small portion of anterior wall of stomach. Fold of stomach in clamp consists of a small portion of the anterior and large portion of the posterior wall.

The mortality after gastroenterostomy at present varies from 3 percent in benign to 20 percent in malignant cases. According to Mayo, the chief causes of death are exhaustion, exhaustion with vomiting, pneumonia, and detachment of the anastomosed intestine.

The Operation. Posterior Gastroenterostomy.—Mayo's "No loop" method. The stomach is exposed by an incision 3/4 inch to the right of the median line. *The whole* stomach and duodenum are examined. No matter what condition is apparent at the first glance, there may be something else present, *e. g.*, a trifid stomach, which it is necessary to recognize.

The transverse colon is drawn out of the wound and by pulling upward and to the right, as much of the mesocolon is brought up with it that the jejunum becomes visible. The jejunum is picked up about 3 inches from the origin. The fold of peritoneum is noted passing from the jejunal origin to the transverse mesocolon; near where this fold joins the mesocolon is the best place in which to tear a hole in the mesocolon and expose the posterior surface of the stomach.

A hole is torn through a nonvascular area of mesocolon. A portion of the posterior wall of the stomach is pulled through this hole. By separating the gastrocolic omentum and with it the gastroepiploic artery, from the greater curvature of the stomach for a short distance it is easy to pull a portion of the anterior as well as of the posterior wall of the stomach through the rent in the mesocolon. It is important to do this in order to drain the very lowest point of the stomach. A gastroenterostomy clamp is applied to a fold of stomach, including about 1 inch of the anterior wall. The direction of the clamp and of the contained fold must be from right to left, and from above downward.

A similar gastroenterostomy clamp is applied to the jejunum along its long axis. The highest point of the gut grasped in the clamp must be 1 1/2 to 3 1/2 inches from the duodenojejunal junction.

The two clamps are placed side by side on the abdominal wall so that the portions of the stomach and jejunum to be anastomosed are well outside the abdomen, embraced by the clamps. The belly is protected with pads and the anastomosis is made in exactly the same way as that described for enteroenterostomy. See INTESTINAL ANASTOMOSIS.

The edges of the rent in the mesocolon ought to be stitched to the stomach. The viscera are returned to the abdomen and the wound is closed.

Anterior Gastroenterostomy. Wolfler's Operation.—The abdomen is opened by an incision in or near the middle line, between the umbilicus and the ensiform cartilage. The cut is about 4 inches long and may be enlarged by a transverse section of the rectus.

The small intestine is exposed by pulling the omentum upward and to the left. The jejunum is then to be found; the loop of gut is emptied and clamps are applied.

On the lowest possible point of the anterior wall of the stomach a spot is selected for the stomach opening. This portion of stomach and the loop of jejunum are pulled out of the belly and the cavity protected with gauze pads. An anastomosis is made between the stomach and the jejunum, using either sutures or the Murphy button. The method of making the anastomosis is identical with that of enteroenterostomy (lateral anastomosis).

The field of operation is cleansed, all instruments which have touched the mucosa are put aside. The line of union is inspected, and if necessary, reinforced with a few Lembert sutures. If the point of union causes the intestine to kink sharply, this may be remedied by a few stitches uniting to the stomach a little more of the afferent or efferent portions of gut or of both. The wound is closed.

The after treatment is very important. As soon as the patient has recovered from the anesthetic he should be placed in the semierect position, as this facilitates the passage of fluid through the anastomotic opening and also tends to prevent pulmonary congestion. In treating these patients Mayo begins to give them one ounce of hot water by mouth at the end of sixteen, eighteen or twenty hours. If it is well borne, the quantity is rapidly increased. At the end of 36 hours he allows liquid food.

Pylorectomy.—By this term is understood the removal not only of the pylorus, but with it as much of the duodenum and stomach as is diseased.

Indications.—The operation is performed almost entirely for carcinoma of the pylorus, although it has been practised in a number of cases for ulcer and cicatricial stenosis of this region. Whether the operation is undertaken or not depends upon the extent of the growth, the amount of adhesions to other organs, and the extent of involvement of glands. In the present state of medical knowledge it is impossible to determine absolutely the existence of carcinoma in its incipiency; but if operation is to be more than palliative, it must be undertaken early. Considering the harmlessness and simplicity of exploratory celiotomy and the fatal consequences of delay, it seems justifiable that, in cases of obstinate gastric disturbances that do not yield to medical means, exploratory operation should be undertaken even in the absence of a palpable tumor. Factors that are of aid in the diagnosis are the existence of dilatation of the stomach, cachexia, an excess of lactic acid, hematemesis, the presence of the Oppler bacillus, absence of free hydrochloric acid, age past 40, and a diminished amount of hemoglobin and number of red blood-corpuscles.

The Operation.—The preparation is the same as for gastroenterostomy. Various methods have been employed. Billroth resected the tumor, and as the opening in the stomach is so much greater than that in the duodenum, the stomach wound was partially closed by suture until it reached a size sufficient for end to end anastomosis with the duodenum. The anastomosis is best made lower than the upper end or middle of the gastric opening, to facilitate emptying the contents of the stomach. Kocher closes both the stomach and duodenum and makes a posterior end to side anastomosis by insertion of the duodenum in the posterior wall of the stomach, with or without Murphy's button. Czerny first performs posterior gastroenterostomy with Murphy's button, and then, after resection of the tumor, closes the stomach and duodenum. Forceps may be used to good advantage.

The average mortality of the operation as now done by skilful surgeons is probably from 20 to 25 percent. Some have reported series of cases with a considerably lower death rate than this, Mayo for instance, having done 100 operations with a mortality of 14 percent and Kocher 58 with a mortality of 15 percent.

Pyloroplasty is the term applied to operative enlargement of a stenosed pylorus. It has fallen into disfavor with the majority of surgeons, although a few still practise it. Mayo states that it failed to give relief in 30 percent of his cases and that another operation had to be resorted to.

The Heineke-Mikulicz operation was devised and performed independently by the surgeons whose names it bears in 1886–87. A longitudinal incision is made at the seat of constriction, the incision is then stretched at its middle at a right angle to the incision, so as to dilate the strictured pyloric opening, and the margins of the opening are sutured in this new position.

Gastroplication or Gastrorrhaphy.—The former is the preferable term. It is used to designate the operation of making a fold in the stomach-wall and suturing it.

Indication.—The operation has been performed chiefly in the treatment of dilatation of the stomach, although its use has been suggested in threatened perforating ulcer. In case the dilatation is due to malignant pyloric stenosis, pylorectomy or gastroenterostomy is the preferable operation.

The Operation.—After opening the abdomen the greater curvature of the stomach is lifted up to the lesser curvature, thus folding the anterior wall on itself, and the fold is held in place by two rows of sutures. A similar result has been attained by certain operators by the use of purse-string sutures.

The permanent results of the operation are not yet definitely determined, for as yet sufficient time has not elapsed to form judgment. Sixteen operations have been reported with but one death. The almost unanimous conclusion of those who have performed the operation is in its favor.

Gastropexy is the name applied to the operation of suturing the stomach to the anterior abdominal wall. The operation has been performed for the relief of gastroptosis or sagging of the stomach, which is with difficulty distinguished from dilatation. The condition present is usually one of general visceral ptosis, hence the operation is commonly futile (Binnie).

Gastroplasty, Gastroanastomosis, and Gastrogastrostomy are performed for hour-glass stomach. In gastroplasty a longitudinal incision is made in the constricted portion between the two pouches of hour-glass stomach; the incision is stretched at a right angle, and sutured as in the Heineke-Mikulicz operation of pyloroplasty. The operation has been performed successfully in 7 cases. In gastrogastrostomy an opening is made in each of the two gastric pouches, and a free communication is established between them by anastomosis of the two openings. The operation has been performed in 5 cases with 1 death. Gastroanastomosis has also been successfully performed by Watson, as follows: The pouches were folded over on the constricted portion between the two as a hinge; the anterior wall of the stomach was incised, to give access to the double septum between the pouches; an opening was made in this double septum and sutured, and the incision in the anterior stomach-wall was closed. This method would be impossible if there were adhesions fixing either pouch.

The three operations seem equally successful, and the one selected would depend upon the mechanic conditions of each case. Hour-glass stomach may be congenital, but usually does not develop until adult life. The most common cause is adhesions following gastric ulcer. It is with great difficulty that a differential diagnosis can be made between this condition and obstruction due to pyloric stenosis. If severe disturbances of digestion arise, as is often the case, one of these operations would be indicated.

Surgical Treatment of Gastric Ulcer.—See STOMACH (Ulcer).

Gastrectomy.—The operation may be either partial or complete. In partial gastrectomy, only a portion of the stomach-wall is removed; pylorectomy is an example of partial gastrectomy. This operation is indicated in cases of tumors of the stomach and in certain perforating or perforated gastric ulcers. Complete gastrectomy is the removal of the entire stomach. It has been believed possible to distinguish between the epithelial layers of the mucous membrane of the esophagus and of the stomach, but recent investigations seem to indicate that no well-marked boundary-line exists, so it is difficult to say absolutely when the entire organ is removed. Sufficiently extensive operations to deserve the name of total gastrectomy have been performed in 10 cases, with 4 recoveries from the operation. Two of these patients have since died from recurrence of the growth.

Indications.—The operation may perhaps be considered indicated in case of extensive malignant growths of the stomach which have not caused metastasis or become extensively adherent to neighboring organs, but the operation should certainly be performed only in the rarest and most unusually favorable cases, by surgeons of exceptional skill and wide experience in abdominal surgery.

STOMACH, ULCER. **Synonyms.**—Peptic ulcer; simple or round ulcer; gastric ulcer.

Etiology.—(1) Traumatism; (2) hemorrhagic infiltrations; (3) hyperacidity; (4) anemia; (5) heart-disease; (6) nephritis; (7) chronic catarrh. Both gastric and duodenal ulcers result from the same causes.

Pathology.—Generally, the ulcerative spot is round in contour and is situated on the posterior wall of the lesser curvature of the stomach. The edges are usually clean-cut, and from above downward are cone-shaped, with the base resting on the peritoneal coat of the organ. In some instances a perforation occurs, leaving a "punched-out" appearance. The duodenal ulcer is usually situated at the upper portion of the bowel. In many cases there is a series of ulcers scattered over the mucous membrane of the stomach.

Symptoms and Clinical Course.—There are localized pain, vomiting, hematemesis, gradual loss of flesh and strength, dyspepsia, grave anemia, and excessive secretion of hydrochloric acid. The hemoglobin may be reduced to 50 percent and the red cells are proportionately decreased. The leukocytes in some cases are decreased; other cases show leukocytosis.

The pain is very characteristic, being always localized and made worse by pressure or ingestion of food. It is of a burning, sharp, or acute character.

Hematemesis is possibly the most marked objective symptom of the disease. It may come on either while taking violent exercise or during the period of rest, and has occurred during the night hours. Hematemesis occurs in about 50 percent of the cases of gastric ulcer.

Complications.—(1) Perforation, giving rise to peritonitis; (2) death from hemorrhage, perforation, or exhaustion; (3) cicatricial contraction, causing obstruction.

Diagnosis.—See GASTRITIS (Chronic).

Prognosis is guardedly favorable.

Treatment.—For the first few weeks after the ulcer has been detected absolute rest in bed should be enjoined, and only a liquid diet allowed. In most cases, perhaps, it is best to give the food by the rectum for the first few days, continuing as long as the digestive powers maintain the strength of the patient.

Rectal Alimentation.—Before giving a nutritive enema the bowels should always be irrigated with a quart of lukewarm water, or normal saline solution, given as a high enema. Peptonized milk is the best nutrient (Tyson).

Boas recommends the following nutritive enema: 8 ounces of milk; the yolks of 2 eggs; 1 dram of sodium chlorid; 1 ounce of claret wine; and a tablespoonful of aleuronat flour. These ingredients to be thoroughly beaten together, subsequently warmed for a few minutes at a temperature of 99° F., and then slowly injected by means of a fountain syringe.

Ewald recommends the following: From 3 to 5 eggs are beaten up with 5 ounces of a 15 percent solution of glucose, to which a small amount of starch-water has been added. Also this: Boil flour (1/2 dram) in half a cupful of a 20 percent solution of glucose and add a wine-glassful of claret. To this are afterward added 2 or 3 eggs, well beaten in a tablespoonful of water.

Later in the treatment milk may be given by the mouth, together with a small amount of soup made from beans or potatoes. No solid food should be given for at least 3 weeks from the time the disease is diagnosed, and then only the lightest articles of diet.

Hematemesis.—Absolute rest must be enjoined, the patient not being allowed to sit up to take food or medicine or to defecate or urinate. If possible neither solids nor liquids should be given by the mouth for at least 2 days. To assuage thirst, the lips and tongue may be sponged off with ice-water containing a very small amount of glycerin.

An ice-bag or cloths dipped in ice-water or the ice-coil may be placed over the affected area. Pieces of ice may be swallowed. Copious enemata of hot water are advocated by Tripier. If the hemorrhage is severe, ergotol (20 minims) may be given hypodermically, together with morphin (1/4 grain). At the present time, however, preference is given to adrenalin chlorid in repeated doses of 10 drops of the 1 to 1000 solution, given in 1 dram of water.

Two weeks after the hemorrhage has occurred, Fox recommends the best treatment, a glass of laxative mineral water daily, with a light diet, and hot applications to the epigastrium. Nitrate of silver (1/4 grain) may be taken in a glass of water before meals.

Bismuth subnitrate in doses of 90 to 120 grains daily has proved most efficient in promoting healing of the ulcer. Local applications may relieve the pain; morphin should be avoided if possible.

The Lenhartz Treatment.—The patient is put to bed for 3 to 4 weeks and for the first 2 weeks is given a diet rich in albumen. Ice-cold food is given slowly by the mouth in small amounts at short intervals, beginning with 2 drams of egg and 4 drams of milk every hour for the first day, the intervals being 1 hour from 7 A. M. to 9 P. M. for the first 10 days. Lembert has suggested feeding the mixture of egg and milk, instead of each singly every hour, and adding sugar after the third day. For the effects of hemorrhage, enterocylsis is practised, and iron and arsenic are given for the anemia.

Surgical treatment may be indicated in non-perforating or in perforating gastric ulcers. The more remote effects of gastric ulcer have been discussed and their treatment has been considered under gastrolysis, gastroenterostomy, pyloroplasty, resection of the stomach, and the operations for hour-glass contraction of the stomach. See STOMACH (Surgery). Acute perforating ulcer indicates operation in case of dangerous and repeated hemorrhage, extremely severe pain, and intractable vomiting and indigestion; or when there is a suspicion of malignant degeneration. In such cases the ulcer may either be excised and the gastric wall sutured, or gastroenterostomy or pyloroplasty may be performed to put the ulcer at rest. Gastroenterostomy has been combined with excision in certain cases, with advantage.

Perforated Gastric Ulcer.—Usually, perforation occurs very suddenly, without any apparent cause, although violent exertion or traumatism has sometimes been the immediate cause. There is intense pain, generally localized in the left hypochondrium; there may be nausea and vomiting, perhaps vomiting of blood; soon after this symptoms of peritonitis set in; the abdomen becomes distended, tympanitic, and tender; and liver dullness is obliterated. The other constitutional symptoms develop as the peritonitis progresses.

Treatment.—All food should be withheld and preparations should be made for immediate operation. The incision may be made in the median line above the umbilicus or to the left of the median line. When the diagnosis is absolutely certain, the incision may be made with advantage parallel to the border of the ribs, as a large proportion of gastric ulcers perforate near the cardia and lesser curvature. A careful search should be made, first of the anterior wall of the stomach, beginning near the cardia, taking next the pylorus, and, finally, the posterior wall, the positions named being given in order of the relative frequency of perforation. The edges of the ulcer are inverted and the stomach-wall is sutured by one or two rows of Halsted or Lembert sutures. Great care should be taken that the entire ulcer is inverted, and careful search should be made for a second perforation or for a threatened perforation. Needless fatalities have resulted from the neglect of both of these precautions. If it is impossible to invert the edges of the ulcer, they may be brought into contact by suture, as if a cutaneous wound were being dealt with; and in case of possible insecure suture, the application of an omental graft would be an additional safeguard. If neither of these procedures is possible, the abdominal cavity may be walled off by iodoform gauze and a tube may be introduced down to the ulcer. The fistula that will result usually closes spontaneously or it may be closed later by a plastic operation. Great care should be taken in cleansing the peritoneal cavity. It should be thoroughly flushed with warm sterile salt solution and any suspicious spots wiped clean; if necessary, counteropenings may be made, and it is usually desirable to drain, not only at the seat of operation, but also from the pelvis. Success depends mainly upon early diagnosis and operation; patients operated upon within 12 hours from the time of perforation have excellent prospects for recovery, the mortality being only about 16 percent since 1896. Other features of importance are the amount of food contained in the stomach at the time of perforation, the condition of the patient, and the skill of the operator. A few years ago the mortality in a series of cases carefully collated was about 53 percent. Moynihan has recently estimated it to be from 35 to 40 percent.

STOMACH-CONTENTS, EXAMINATION.—For purposes of examination, the contents of the stomach should be obtained through the stomach-tube, as vomited contents contain so much buccal and esophageal mucus that the examination is rendered difficult and imperfect. See LAVAGE. The gastric contents are examined as to color, amount, odor, consistency, individual food elements present and their state of disintegration and solution; also as to the presence of mucus, blood, pus, fragments of mucous membrane, or foreign bodies. This macroscopic investigation is followed by chemic analysis and microscopic examination.

Test-meals.—The contents are usually examined after a test-meal. One of the following test-meals is usually employed:

1. Ewald-Boas test-breakfast consists of 1 or 2 rolls and a cup of water. The examination is made 1 hour after eating.
2. Leube-Riegel test-dinner consists of soup, meat, potato and roll. Examination is made 3 or 4 hours afterward.
3. A meal consisting of 1 or 2 broiled finely chopped beef-balls, 1 or 2 ordinary slices of dry stale bread, and a cup of water (hot or cold). This is eaten at 9 o'clock in the morning, and the stomach is examined at 12 o'clock noon. No breakfast is allowed before 9 o'clock in the morning.

If possible, the stomach-contents are obtained undiluted, a feat quite readily accomplished by the Ewald expression method, which consists of voluntary contraction of the patient's diaphragm and abdominal muscles, thereby compressing the stomach and forcing a portion of the contents upward through the tube. Usually from 40 to 100 c.c. are thus obtained, and then filtered, and examined for hydrochloric acid. Before filtration, however, the contents may be tested for free acid by Congo paper, which changes from red to blue.

The chief tests for free hydrochloric acid are Günzburg's, Boas', and Toepfer's.

Gunzburg's reagent is composed of phloroglucin (2 gm.), vanillin (1 gm.), and absolute alcohol (30 c.c.); it is unnecessary to use absolute alcohol, as ordinary pure alcohol will do as well. This solution is changed by the light, and should be kept in a colored-glass bottle. A porcelain capsule is overlaid with gastric filtrate, and 3 or 4 drops of the reagent added; the capsule is agitated to insure thorough mixture, and evaporated to dryness slowly over a Bunsen burner or an alcohol lamp. In the presence of free hydrochloric acid a beautiful rose-red color appears.

Boas' reagent consists of resorcin (5 gm.), white sugar (3 gm.), and alcohol (100 c.c.), and gives, with free HCl, a bright-red color, the test being conducted in the same manner as with the phloroglucin vanillin solution.

Toepfer's reagent is a 0.5 percent alcoholic solution of dimethylamidoazobenzol. It must be kept in a colored bottle. In the presence of free HCl it strikes a bright cherry-red without the use of heat. To 5 c.c. of the gastric filtrate add 1 or 2 drops of the reagent, and the whole turns red. This is a delicate, convenient, and valuable test, and is quickly made. It reacts to large (unusual) amounts of lactic or other organic acid, but in ordinary work this objection has no force. Friedenwald thinks highly of the test; Einhorn considers it somewhat unreliable; Hemmeter gives it front rank; and by others it is valued greatly.

Not only is Toepfer's reagent useful in the qualitative detection of free HCl, but also its quantitative estimation. Thus 10 c.c. of the gastric filtrate reddened by the addition of the reagent are treated by a decinormal sodium hydrate solution from a buret until the red gives place to a yellow color, and the number of cubic centimeters of soda solution required to neutralize the free HCl is taken as the multiplier of 0.00365. For example, 3 c.c. of soda solution are used and $0.00365 \times 3 = 0.1095$ percent.

For the determination of the amount of free HCl, organic acids, and acid salts, a 1 percent aqueous solution of alizarin may be used. To 10 c.c. of the gastric filtrate add 1 or 2 drops of the alizarin solution, and neutralize with decinormal sodium hydrate solution; a violet color results.

It is important to know the **total acidity** of the gastric contents, which is obtained as follows: To 10 c.c. of the gastric filtrate add 1 drop of the 1 percent alcoholic solution of phenolphthalein, and neutralize with decinormal sodium hydrate solution added slowly from a buret; a cherry-red color results. The number of cubic centimeters of sodium hydrate solution required to neutralize 10 c.c. of gastric filtrate is expressed as if 100 c.c. of the filtrate were used. The normal total acidity after a test-breakfast is from 40 to 65 percent—*i. e.*, 4 to 6.5 c.c. of soda solution are required to neutralize 10 c.c. of the gastric filtrate.

Lactic Acid.—For the detection of lactic acid Uffelmann's test is commonly used: Ten c.c. of a 4 percent solution of carbolic acid are diluted with 20 c.c. of distilled water, and 1 drop of ferric chlorid solution is added, which gives rise to an amethyst-blue color. The gastric filtrate is added, and if lactic acid is present, a canary-yellow color is produced. Alcohol, phosphoric acid, and glucose also give the reaction.

Butyric Acid.—Fatty acids may usually be detected by the odor. As they are volatile, the vapor arising from a test-tube in which the gastric filtrate is boiling reddens blue litmus paper held at the mouth of the tube.

Acetic acid may be detected by its odor, but it is better to extract with ether, evaporate, make an aqueous solution of the residue, neutralize with soda solution, and add a weak ferric chlorid solution, which gives a dark red color if acetic acid is present.

The Digestion of Proteids.—The hydrochloric acid of the gastric juice combines with albuminoids to form first syntonin or acid albumin. Pepsin·hydrochloric acid digestion then results in the formation of proto- and heteroalbumose. Following this change deuteroalbumoses are formed, and, finally, peptones. These albumoses are grouped under the name of propeptone, and though by elaborate tests they may be separated and differentiated, it suffices that propeptone is precipitated by adding an equal part of a saturated solution of sodium chlorid and acidulating with acetic acid; it dissolves on heating, and precipitates again on cooling. Peptone yields a purplish-red color upon the addition of Fehling's solution to the filtrate, as also does propeptone.

Rennet Ferment.—Add about 4 drops of the filtrate to 5 c.c. of fresh milk, and place in warm water (100° F.). In 15 minutes coagulation should take place. In case the milk is not curdled in half an hour, add 2 or 3 drops of a 1 percent solution of calcium chlorid, and if coagulation takes place, it indicates the presence of rennet zymogen.

Starch Digestion.—The action of saliva upon starchy foods is continued in the stomach to the formation of erythrodextrin, achroodextrin, and maltose. Tested with Lugol's solution, erythrodextrin strikes a reddish-brown color, while achroodextrin and maltose give no color change.

The microscopic examination of the gastric contents is important. In cases of hyperchlorhydria unchanged starch granules are often present in large numbers; while in cases of deficient gastric secretion undigested muscle-fibers are more numerous than under normal conditions. With benign pyloric stenosis, gastrectasia, and food stagnation, sarcinæ and yeast-cells are often found. They may be stained with methyl-blue, which also stains the so-called "Faden" bacillus—the Oppler-Boas bacillus—found with carcinomatous pyloric stenosis, and so significant of the disease. This is a very long, delicate, thread-like bacillus. Sarcinæ and yeast-cells are also found in the stagnating contents of carcinoma ventriculi, but not so frequently as in benign stenosis.

Pus-cells are rarely found. Red blood-corpuscles may be present. Mucus, epithelium, and mucus-corpuscles are commonly seen, especially in gastric catarrh. Many bacteria are present, among which may be a number that give rise to the formation of lactic acid. Small fragments of mucous membrane are sometimes found in the washings from the stomach, and they have been especially studied by Boas, Einhorn, and others. They have been found in cases of gastric erosion. They should be hardened, stained, and mounted, as atrophy of the glands or mucoid or cancerous degeneration may thus be discovered.

STOMATITIS, APHTHOUS (Herpetic Stomatitis; Vesicular Stomatitis).—This form of stomatitis is more common than the simple catarrhal form. It is characterized by a hyperemia of the mucous membrane of the mouth, and by the formation upon it of small, yellowish-white vesicles of a herpetic character. Children from 6 to 18 months of age are the most commonly affected.

Etiology.—The direct cause is uncleanliness of the mouth, improper and poorly prepared food, and dentition. The predisposing causes are malnutrition, unhygienic surroundings, digestive disturbances, and the tubercular diathesis.

Symptoms.—Quite characteristic symptoms are noticed in this affection. The child is dull, fretful, and feverish, does not wish to be disturbed, and refuses nourishment. The mouth is hot and painful, and the saliva, running over the chin and neck, causes these parts to be irritated. On inspecting the mouth, small vesicles are found under the tongue, on the gums, or upon the inner side of the lips. The vesicle soon disappears, but a small shallow ulcer remains for 4 or 5 days. These herpetic spots may be discrete or diffuse, covering more or less of the mucous membrane.

Treatment.—This affection is evidently self-limited. Recovery without treatment, as a rule, would probably take place in the course of a week or 10 days. As recommended in catarrhal stomatitis, however, in all cases the diet should be carefully regulated, the bowels gently acted upon with a laxative, the hygienic conditions, if faulty, improved, and the mouth and the nursing-bottle kept clean. In any form of stomatitis the following is an excellent mouth-wash:

℞.	Salicylate of sodium,	ʒ ij
	Water,	℥ j.

Apply 5 or 6 times a day.

If the ulcers heal slowly, they should be touched with a stick of nitrate of silver.

STOMATITIS, CATARRHAL.—A simple catarrhal inflammation of a portion or of the entire surface of the mouth. It occurs most commonly during the period of first dentition.

The causes are uncleanliness of the mouth and of the nursing-bottle, etc., the ingestion of irritating or overheated food, and the eruption of the teeth. It may be secondary to gastrointestinal disturbances or to the exanthems.

Symptoms.—The mouth is red and is at first dry and hot; later, there is an increased salivary flow, which becomes acid and excoriates the skin around the mouth as it is dribbled. The tongue is coated, and the child is restless, feverish, and thirsty; the appetite is diminished, and the bowels usually are constipated.

Sucking causes pain, which is shown by the fact that the child drops the nipple with a cry as soon as its hunger is partly satisfied. The course of this form of stomatitis is usually acute, an attack lasting about a week.

Treatment.—Attention to the proper hygiene of the mouth will usually prevent it from becoming sore. The nursing-bottle and nipple should be kept scrupulously clean; the fingers should not be introduced into the child's mouth before being thoroughly cleansed; and, before and after feeding, the infant's mouth should be washed with plain boiled water or with borax and water on a clean, soft cloth. Careful regulation of the diet, a mild laxative, such as small doses of calomel (1/12 grain every 2 hours) or calcined magnesia (10 or 20 grains); and a mild alkaline mouth-wash, such as the following, will usually be sufficient to cure the condition:

℞.	Borax,	ʒ j
	Glycerin,	ʒ ij
	Rose-water,	℥ ij.

Use every 1 or 2 hours with a swab, gently washing the mouth. (Older children will be able to wash their mouths without the swab.)

STOMATITIS, GANGRENOUS (Noma; Cancrum Oris).—A rare affection, consisting of a gangrenous destruction of the tissues of the cheek, and possibly of the adjoining structures as well.

Etiology.—It is supposed to be microbic in origin. The most frequent predisposing causes are the exanthems or any disease which leaves the child weak and debilitated. In nearly all cases it is seen in those who are subjected to the worst possible hygienic and sanitary surroundings.

Symptoms.—There will be noticed at first an inflamed spot on the inside of one cheek near the corner of the mouth. This spot is at first hard, but soon ulcerates, and the cheek becomes swollen and edematous. From the first the breath has a gangrenous odor, and later the fetor becomes intense.

The gangrenous process spreads rapidly, perforating the cheek, and death will be caused by septic pneumonia or by a general systemic poisoning. Many cases die as early as the first 3 or 4 days, while others linger 2 or 3 weeks; recovery is extremely rare.

Treatment.—Strict cleanliness of the mouth in children whom debilitating diseases render liable to this affection is of prophylactic importance. When the gangrenous condition has commenced, however, the only treatment that offers any hope is free excision of the affected areas.

STOMATITIS, PARASITIC (Thrush).—An affection of the mouth characterized by a catarrhal condition and by the presence on the mucous membrane of white, flake-like patches. It occurs usually in young infants, and is caused by a vegetable parasite (one of the mold fungi) variously known as oidium albicans or saccharomyces albicans.

Etiology.—Uncleanliness of the mouth, giving rise to acid fermentation, is the principal indirect cause. It may be transmitted from one child to another by the nursing-bottle, spoons, etc. Dirty nipples and long nursing-tubes offer a fertile soil for the propagation and growth of the parasites.

Symptoms.—The fungus appears on the inside of the lips, on the gums, tongue and hard and soft palates, and may be limited to a small area of these parts or may extend to the pharynx or esophagus. It is white or gray in color, and has the physical appearance of curdled milk, for which, upon superficial examination, the spots might be mistaken; it will be found, however, that they are adherent to the mucous membrane.

The general symptoms are those of catarrhal stomatitis, by which it is accompanied. Microscopic examination of the deposits will make the diagnosis certain, if any doubt exists.

Treatment.—Absolute cleanliness of the child's mouth, and of the feeding apparatus and everything that may be brought in contact with it, is essential.

The diet must be appropriate and carefully regulated and prepared, and the general hygienic conditions must be made as good as possible, as this is essentially a filth disease. The mouth should be carefully washed every 1 or 2 hours when the child is awake, and before and after each feeding. The cloths that have been used to wash the mouth should be burned, and care should be taken to keep all articles that may have been in the mouth away from other children, as thrush may be conveyed from one to another.

The following formula is an efficient mouth-wash for this condition:

℞.	Listerine,	℥ j
	Dobell's solution,	℥ ij.

Dilute with an equal quantity of water and wash the mouth frequently.

STOMATITIS, ULCERATIVE.—This form of stomatitis consists of an inflammation and ulceration of the mucous membrane of the gums principally, though the tongue and cheeks may also be affected. It may occur at any time after dentition commences, but is most common between the ages of 3 and 10 years.

Etiology.—Ulcerative stomatitis is a prominent symptom of infantile scorbutus; it is also seen following the acute infectious diseases, and it is caused by salivation from the administration of mercury. Unhygienic conditions, malnutrition, etc., are common predisposing causes.

Symptoms.—Constitutional symptoms, such as slight fever, restlessness, anorexia, and thirst are usually present. The edge of the gums over the teeth—usually the lower incisors—is first seen to be reddened and swollen. The pain and salivation are more marked than in aphthous stomatitis, and the saliva is acrid, irritating, and of an offensive odor. The mucous membrane soon becomes purplish in color, spongy, and congested, and hemorrhages from it occur on the slightest pressure. The tongue is coated, the breath foul, the appetite lost, and the child rapidly becomes weak and emaciated. Under favorable conditions and proper treatment the affection usually disappears in 1 or 2 weeks. When caused by a cachectic condition or by constitutional disorders, such as scorbutus, the course will be governed by these conditions. In protracted cases the ulcerations may become gangrenous, and necrosis of the jaw may ensue.

Treatment.—The sanitary surroundings should, if faulty, be improved, and fresh air and sunlight are essential. Nourishing liquid diet should be given, and cool drinks to satisfy the thirst. If there is any constitutional disease that is the possible cause of the stomatitis, it should be properly treated.

Chlorate of potassium is a specific in this form of stomatitis. It should be given internally (as it is eliminated by the salivary glands) and as a mouthwash. A child under 1 year of age may safely be given from 10 to 20 grains in the course of 24 hours, and it is best given in small doses, frequently repeated. A convenient method of administering this remedy is to dissolve 1 dram in half a glass of water, giving from 1/2 to 2 teaspoonfuls, according to the child's age, every 1 or 2 hours. The mouth should be frequently washed with the same solution or with a solution of borax or salicylate of sodium. A teaspoonful of dioxid of hydrogen to the ounce of water also makes an effective wash.

STONE.—See Bladder (Stone), Gall-bladder (Diseases), Kidney (Stone).

STOOL.—See Feces.

STOVAIN.—Benzoylethyldimethylaminopropanol hydrochlorid. It is more stable than cocain, and is less than one-half as toxic as cocain, though equally powerful as an anesthetic, and has the great advantage of being a vasodilator, cocain being a vasoconstrictor. As a substitute for the latter it is used with great satisfaction for local and spinal anesthesia. Locally it may be used in the eye in 4 percent solution and applied to other mucous membranes, in 5 to 10 percent solution. For hypodermic injections for local anesthesia it can be used in 0.75 to 1 percent solution. For spinal injection, 1/2 to 5/8 of a grain is used (Babcock) in the spinal fluid, the alkalinity of which necessitates the addition of sodium chlorid in the proportion of 5 percent. See Intraspinal Anesthesia.

STRABISMUS.—See Eye-muscles.

STRAMONIUM (**Thorn-apple**).—The dried leaves of *Datura stramonium*, the well-known Jamestown or jimson-weed. It contains the alkaloids *atropin* and *hyoscyamin*, also some *hyoscin*, and a volatile oil containing daturic acid. *Daturin* is the name of the mixed alkaloids. Dose, 1/2 to 3 grains. See Belladonna. It has the general properties of belladonna, but is more powerful. Stramonium has held a high position as a local remedy in spasms of the glottis and in asthma. The smoke from the burning leaves may be inhaled. A convenient means of using it is to draw the fumes into the lungs through a pipe filled either with the pure leaves or with a mixture of the same with tobacco. The impression is ordinarily combined with that of nitrate of potassium. The effect should be carefully watched, since the poisonous properties of the drug may easily be induced. The smoke from about a half ounce of the leaves may be inhaled at a single sitting. The number of sittings is determined by the attendant circumstances. A sensation of heat in the lung, of fulness about the head, or of nausea is an indication that a maximum has been reached.

Preparations.—**S., Ext.** Dose, 1/8 to 1/2 grain. **S. Flext.** Dose, 1/2 to 3 minims. **S., Tinct.**, 10 percent strong. Dose, 5 to 15 minims. **S., Ung.**, contains of the extract 10, water 5, benzoinated lard 85 parts. **Daturin** is the alkaloid. Dose, 1/200 to 1/80 grain.

STRANGULATION.—See Asphyxia, Hernia, Intestinal Obstruction, Neck (Injuries).

STRANGURY.—Painful, scanty urination. It is a most prominent feature of poisoning by turpentine or cantharides, being induced even by the action of a blister. In various inflammatory conditions and morbid growths of the bladder and prostate gland it is also present, and is a constant symptom of acute posterior urethritis.

Treatment.—As a rule, hot baths and morphin are the most efficacious remedies. Free saline purging and the administration of belladonna are recommended. Barley-water, effervescing waters, milk, and other bland drinks are to be freely taken when the attack exists. Thirst may be slaked by iced drinks.

If there is overdistention of the bladder, catheterization may be necessary. See Urine (Retention).

STREPTOCOCCUS.—See Serum Therapy; Suppuration; Vaccine Therapy.

STRICTURE.—See Esophagus (Stricture), Rectum (Stricture), Uretha (Stricture), etc.

STRIDOR.—A peculiar, harsh, vibrating sound arising from some obstruction in the throat or in the larger respiratory tubes. It is most commonly due to compression of the trachea by some extraneous growth, or to spasm or paralysis of the vocal bands.

STROKE.—See Brain (Hemorrhage), Heat-stroke.

STRONTIUM.—This metal is represented in medicine by its salts, the bromid, iodid, salicylate (see Bromin, Iodin, Salicylic Acid) and the lactate. They are believed to be much less irritating to the stomach and less prone to cause eruptions than the sodium and potassium salts, though at the same time they are less powerful than the latter. Elimination, too, is more rapid and more complete.

The lactate in doses of 5 to 30 grains has been successfully employed in diabetes and in albuminuria. It diminishes the amount of albumin in Bright's disease, in the parenchymatous nephritis of rheumatic and scrofulous subjects, and in the albuminuria of pregnancy; for which purpose it should be given in full doses (gr. xxx) thrice daily. It is contraindicated when there is scanty urine or symptoms of uremia.

STROPHANTHUS.—The ripe seed deprived of its long awn, of *Strophanthus Kombé*, an African climbing plant from which the natives extract a toxic preparation known as the Kombé arrow-poison. It contains a crystalline glucosid, named *strophanthin*, the active principle, which is an agent of great energy, the frog being killed by a solution of 1 part in 10,000,000. Dose of strophanthus, 1/2 to 2 grains. In medicinal properties it closely resembles digitalis, producing loss of reflex sensibility and of voluntary motion, but not causing contraction of the arteries to the same degree. Strophanthus is undoubtedly a valuable cardiac stimulant, from the rapidity and permanence of its action, as well as from its non-interference with the caliber of the peripheral vessels. It promptly relieves cardiac dyspnea, often modifies the pulse-rate in less than an hour, while the influence of a single dose upon the circulation persists for a long time. It may replace digitalis in the treatment of chronic nephritis and valvular lesions of the heart, when it is important that the work of the heart should not be increased by any additional resistance in the arterial system. It has been reported as useful in the treatment of dyspnea, orthopnea, dropsy, and uremia, also in mitral insufficiency, with great anasarca and dyspnea; in palpitation, exaggerated cardiac action, and in weak heart, and for exophthalmos, with tumultuous action of the heart; also in pulmonary edema, due to valvular lesions or to pneumonia. It is useful in endocarditis, also in atheroma of the arteries; in reflex palpitation of neurasthenia, hysteria, and chlorosis, and for rigors due to catheterization or operations on the urethra. Dose of the tincture, 5 to 10 minims; of strophanthin, 1/300 to 1/100 grain.

STRUMA.—See Scrofula.

STRYCHNIN.—$C_{21}H_{22}N_2O_2$. A poisonous alkaloid in the fruit of *Strychnos nux vomica* and found in St. Ignatius' bean. It crystallizes in four-sided prisms, melting at 284° C., and possessing an extremely bitter taste. See Nux Vomica.

STUMP.—See Amputation.

STUTTERING.—See Speech Defects.

STYE (Hordeolum).—A furuncular or phlegmonous inflammation near the hair follicles or margin of the lid. Eye-strain is a common cause.

Symptoms.—It begins with a pricking pain, soon followed by swelling of the affected lid. A tender, hard spot is easily located by palpation, and may be inspected by raising the lid away from the eyeball, when a yellowish point will be seen.

Treatment.—If pus is seen, it should be released; and, as a rule, the symptoms will usually immediately subside. The pointing of the stye is hastened by the application of hot compresses for 15 minutes every 2 hours. To prevent recurrence, cleanliness and disinfection with a lukewarm bichlorid solution (1:5000) are demanded. A 10 percent sulphur ointment may be used. Recurrence of styes is suggestive of refractive error or of constitutional disorder, and the ametropia should be corrected and the general health improved.

STYPTICIN.—The hydrochlorid of cotarnin, a base produced by the oxidation of narcotin. It has been used with good results as a styptic and sedative in a number of cases of uterine disease, the dose being from 1 to 5 grains by mouth or hypodermically, four or five times a day.

STYPTICS.—See Hemostatics and Styptics.

STYRACOL.—Guaiacol cinnamate. Styracol is an intestinal antiseptic and is claimed to combine the antituberculous actions of guaiacol and cinnamic acid. It is said to liberate in the intestinal canal a larger proportion of its guaiacol (up to 85 percent) than other synthetic preparations of that substance. Dose, 15 grains.

STYRAX (Storax).—A balsam obtained from the wood and inner bark of *Liquidambar orientalis*, or oriental sweet-gum. It contains a volatile oil (styrol), a crystalline solid (styracin), several resins, and cinnamic acid. It is a stimulant expectorant, an antiseptic, and disinfectant, acting like benzoin and tolu, and is used in bronchial affections and in catarrh of the urinary passages. Externally, it is an antiseptic and parasiticide. It is a constituent of Friar's balsam. Dose, 5 to 20 grains.

SUBARACHNOID INJECTION.—See Intraspinal Anesthesia.

SUBINVOLUTION.—Failure or delay on the part of the uterus to return to its normal condition after labor. See Involution.

SUBLAMIN.—A combination of mercuric sulphate and ethylene diamin, containing 43 percent of mercury. It is insoluble in alcohol, but freely soluble in water, and is used in 1:500, or 1:1000 solution for disinfecting hands and instruments.

SUBLIMATE.—See Mercury.

SUBMERSION.—See Drowning.

SUBUNGUAL EXOSTOSIS.—See Nails (Diseases).

SUCCUSSION.—The shaking of the individual from side to side for the purpose of determining the presence of fluid in a cavity or hollow organ of the body. **The succussion sound or splash** is the peculiar splashing sound heard in hydropneumothorax or pyopneumothorax when the patient's chest is slightly shaken. It is due to the combined presence of air and fluid in a closed cavity. It was first described by Hippocrates, and hence is also known as the "Hippocratic sound." The sound may also be obtained in the presence of a dilated stomach partly filled with fluid. See CHEST (Examination).

SUDAMEN.—See SWEAT GLANDS.

SUDDEN DEATH.—See DEATH (Sudden).

SUDORIFIC.—See DIAPHORETICS.

SUFFOCATION.—See ASPHYXIA.

SUGAR.—See DIABETES, URINE (Examination).

SULPHOCARBOLATE.—The old name for phenolsulphonate. A salt of phenolsulphonic acid (sulphocarbolic acid). See PHENOLSULPHONATE.

SULPHONAL.—Sulphonmethane. Acetone diethysulphone. It is soluble in 100 parts of water at 16° C., in 20 parts at 100° C., and readily soluble in alcohol; it crystallizes in colorless leaflets or plates that melt at 126° C., and is odorless and tasteless.

Therapeutics.—As a hypnotic sulphonal acts admirably in many instances, if administered in hot fluids and about 2 hours before its action is required; but its efficacy decreases with use, and it is of no value whatever against insomnia due to pain. The average hypnotic dose is about 20 grains for a woman and 30 grains for a man. The dose is to be administered only once daily, and should be discontinued at the first sign of toxic action. In no case should its administration be continued over any great length of time. In cases of insomnia due to neuralgia and nervous excitement, the dose of sulphonal may be advantageously combined with a small dose of morphin, in proportion to suit individual cases, the mixture forming a safe and efficient hypnotic. An excellent hypnotic combination is made by mixing together 10 or 15 grains each of sulphonal and trional, to be taken in some hot liquid at bed-time. The trional producing early sleep and the sulphonal effects being manifested later, the patient will usually obtain a more prolonged result from the small dose of each agent administered together than from a larger dose of either alone. See TRIONAL.

Poisoning.—The prolonged use of sulphonal may give rise to such minor toxic effects as noises in the ears, headache, vertigo, weakness, and incapacity for mental or physical exertion. The patient may next pass into a condition of drowsiness or stupor and even death, or he may suffer from difficulty of speech; ptosis, edema of the eyelids, and cyanosis may occur. The stopping of the drug in subjects of sulphonism is followed by vertigo, motor disturbances, general weakness, digestive disturbances, etc., a condition resembling that in morphinism when the morphin is suddenly cut off (Lepine). In one reported case a dose of 20 grains nightly for 15 months was accompanied by complete cessation of menstruation (Potter). It has produced persistent skin eruptions in some cases and severe functional disturbances in others. The chief characteristics of chronic poisoning by this drug are as follows: Disturbances of digestion, shown by vomiting and diarrhea or constipation; disturbances of the nervous system, as ataxia and feebleness of the limbs, ptosis, and ascending paralysis; also ischuria and oliguria, sometimes albuminuria, or the presence of hematoporphyrin (Karst). Recovery follows rapidly if the entire alimentary tract is thoroughly purged; and as long as this is kept free, and the kidneys act efficiently and normally, the drug may be considered harmless (Fuerst). In order to secure elimination and to guard against cumulative action and consequent toxicity, its administration should be interrupted from time to time. Anorexia, vomiting or pains in the stomach may be regarded as indications for immediate discontinuance (Karst).

SULPHUR (Brimstone).—S = 32; quantivalence II, IV, VI. Sulphur is official in three forms:

Sulphur Sublimatum, *Sublimed Sulphur*, prepared from crude sulphur by sublimation and condensation. It is a fine citron-yellow powder, of faintly acid taste and acid reaction, insoluble in water or alcohol. Ignited it burns with a blue flame, forming sulphurous acid gas, and leaving no residue or only a trace. Dose, 10 grains to 2 drams.

Sulphur Lotum, *Washed Sulphur*, prepared by digesting sublimed sulphur with dilute water of ammonia, thoroughly washing with water and passing through a sieve. Solubility and dose same as for sulphur precipitatum.

Sulphur Precipitatum, *Precipitated Sulphur, Lac Sulphuris, Milk of Sulphur*, prepared by boiling sublimed sulphur with slaked lime and water. It is a very fine, yellowish-white, amorphous powder, odorless and almost tasteless, insoluble in water or alcohol, but completely soluble in carbon disulphid or in a boiling solution of soda. By heat it is completely volatilized. Dose, 10 grains to 2 drams.

Sulphur is chiefly used as a laxative when pultaceous rather than liquid stools are required, as in hemorrhoids and anal fissure, also in constipation. Scabies has long been treated by its local and internal use, but sulphur alone does not kill the itch insect. The older sulphur ointments were made with sublimed sulphur, and probably contained a considerable amount of sulphurous acid, on which their parasiticide property depended. The later ointments, made with purified sulphur, all contain an alkaline ingredient and develop sulphids, which are powerful insect poisons. Sulphur fumigations are practically applications of volatile sulphurous acid, while most of the sulphur baths and sulphurous mineral waters are solutions of sulphuretted hydrogen or of the alkaline sulphids. They are of value in lead poisoning to favor the elimination of that metal, in chronic constipation, chronic rheumatism and sciatica and many skin diseases, especially chronic psoriasis, eczema, pityriasis and prurigo. The ointment is used in scabies.

Preparations.—**S. Dioxid,** SO_2, a colorless gas of irritating odor, formed by the combustion of sulphur; and in the presence of moisture acting as a powerful bleaching and disinfecting agent. As an insecticide it is unexcelled. See DISINFECTION. **S. Iodidum,** I_2S_2, used as an ointment, 30 grains to

1 ounce. **S. Ung.**, washed sulphur 15, benzoinated lard 85 parts.

SULPHURIC ACID.—H_2SO_4. Oil of vitriol, a heavy, oily, corrosive acid, consisting of not less than 92.5 percent sulphuric anhydrid and 7.5 percent water. Its uses and actions are the same as those of most other mineral acids, particularly hydrochloric acid. In lead-poisoning it forms an insoluble sulphate. It is used as a remote astringent in diarrhea, hemorrhoids, hemorrhages, night-sweats, and in mucous discharges. It does not increase the acidity of the urine. In **poisoning** by sulphuric acid water is to be avoided. Alkalies—such as sodium carbonate or bicarbonate, magnesia, chalk, soap, whiting, and wall plaster—are antidotes. Albumin, flour, milk, starch, and oilve oil will protect the mucous membranes. Of antagonists, opium, ammonia (intravenously), and alcohol may be given to combat the depression of the vital powers.

Preparations.—Acid, Sulph. Aromatic., contains 20 percent (by weight) acid, diluted with alcohol and flavored with cinnamon and ginger. Dose, 5 to 15 minims, well diluted. **Acid., Sulph. Dilut.**, contains 10 percent strong acid to 90 of water. Dose, 5 to 40 minims, well diluted.

SULPHUROUS ACID.—H_2SO_3. A colorless acid containing about 6 percent sulphurous anhydrid in 94 percent water. The gas, SO_2, is a very valuble disinfectant. The acid is used as a spray or lotion in diphtheria and stomatitis, and as a wash for indolent and syphilitic ulcers. The various hyposulphites are mainly valuable in that they decompose and give off sulphur dioxid. Dose, 5 minims to 1 dram. See MAGNESIUM, POTASSIUM, and SODIUM.

SUMBUL.—The dried rhizome and root of an undetermined plant. It contains *angelic* and *valeric acids*, also a volatile oil, balsamic resins, and a bitter principle. Dose, 10 to 60 grains.

Sumbul is an efficient nerve tonic, having qualities closely resembling musk and valerian. It is used by the Russian physicians in very many morbid conditions and seems to be a favorite remedy in that country for almost any disease. It is probably of some value in hysteria and other nervous derangements of delicate females, and may be used as a substitute for musk in typhoid conditions and fevers, asthma, delirium tremens and perhaps in epilepsy.

Extractum S. Dose, 1 to 10 grains. **Fluidextractum S.** Dose, 10 to 60 minims.

SUMMER COMPLAINT. — See CHOLERA INFANTUM, CHOLERA MORBUS.

SUNBURN.—The superficial local effects of exposure to the sun's rays. In slight cases little or no treatment is required. Powdered starch, zinc oxid, bismuth or boric acid, or mere sprinkling with elder-flower water or rose-water may suffice. A solution of ammonium acetate may be pleasant. Severe cases require lead lotion, with morphin or cocain. Subacetate of lead with glycerin and elder-flower water or rose-water makes a good application. Preventive treatment consists in protecting exposed parts from the sun's rays. Sunshades, veils, and masks are useful but inconvenient. The greased paints used by actors may be employed in sea-bathing. Pigments mixed with glycerin of starch are better than those compounded with grease. For the freckles following sunburn, lotions of mercuric chlorid or boric acid—especially when made with almond water in emulsion by the use of glycerin—or the juice of cucumber may have a beneficial effect. See FRECKLES.

SUNSTROKE.—See HEAT-STROKE.

SUPERIMPREGNATION.—Two varieties of superimpregnation are described: (1) Superfecundation and (2) superfetation.

Superfecundation is the fecundation of two or more ovules at or near the same period of time. It occurs in one variety of twin pregnancy.

Superfetation is the production of conception while an embryo already exists in the uterus. Some remarkable cases have been reported that would seem to prove the possibility of its occurrence. That it can occur after a long interval is doubtful, however, since there is no proof of ovulation during pregnancy.

SUPERINVOLUTION.—An exaggeration or abnormal prolongation of that process by which the uterus regains its normal condition after labor. See INVOLUTION.

SUPPOSITORY.—A solid, medicated compound, designed to be introduced into the rectum, urethra, or vagina. Its consistency is such that, while retaining its shape at ordinary temperatures, it readily melts at the temperature of the body. The basis of most suppositories is oil of theobroma. For urethral suppositories a mixture of gelatin and glycerin is used. It is generally molded into a conic shape, but is sometimes cylindric or spheric. According to the directions in the U. S. P.: *Rectal suppositories* should be cone-shaped or spindle-shaped, and when made from oil of theobroma should weigh about 2 grams.

Urethral Suppositories (*Bougies*) should be pencil-shaped, pointed at one extremity, and either 7 cm. in length, weighing about 2 grams, or 14 cm. in length weighing about 4 grams, when made with glycerinated gelatin. If prepared with oil of theobroma, they should weigh about one-half the above quantities.

Vaginal Suppositories should be globular or oviform in shape and weigh about 10 grams if made with glycerinated gelatin, and about 4 grams if made with oil of theobroma.

There is one official suppository, the glycerin suppository, containing glycerin, monohydrated sodium carbonate, stearic acid, and water.

Anodyne suppository:

℞.	Extract of opium,	gr. j
	Extract of belladonna leaves,	gr. ss
	Extract of hyoscyamus,	gr. ij
	Cacao-butter, a sufficient quantity to make 6 suppositories.	

Use one in the rectum morning and night.

SUPPRESSION OF URINE.—See URINE (Suppression).

SUPPURATION.—By this term is meant the production of pus. While it is true that experimentally (as by the hypodermic injection of nitrate of silver, calomel, turpentine, abrin and ricin) suppuration can be produced without the presence of pyogenic bacteria, yet it may be laid down as a broad general principal that where there is pus there also are found the bacteria or the poisons that produce it.

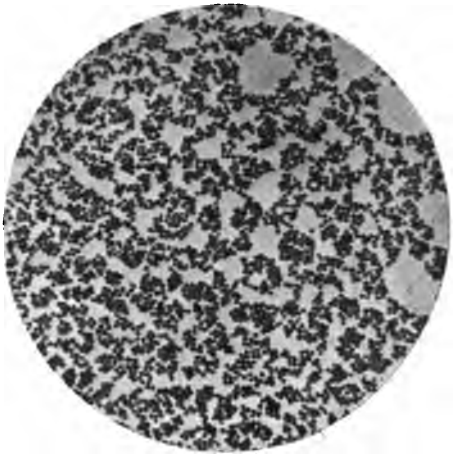
Pus from an acute abscess in an otherwise healthy person is a thick, creamy, opaque, yellowish-white, slightly alkaline fluid, with a faint odor, salty taste, and a specific gravity of about 1030. If a drop is examined under the microscope, it is found to consist of a fluid (the liquor puris) and corpuscles (pus-cells). Some of these corpuscles are globular, slightly granular, and measure 1/2400 inch in diameter, while some contain two or three nuclei, which are made more evident on the addition of acetic acid to clear up the granular matter. Among them may be seen other corpuscles, indistinguishable from leukocytes, and exhibiting, when examined on a warm stage, ameboid movements. The latter are living leukocytes and tissue cells; the former, leukocytes and proliferated tissue cells that have undergone death and degeneration. The proportion of dead to living pus-cells varies with the duration of the inflammation. The liquor puris consists of water, albumin, and salts, of which chlorid of sodium is the chief. It coagulates on boiling. Though probably derived in chief part from the exudation of the serum through the vessels, it differs from serum in that it does not coagulate spontaneously. In acute abscesses the pus contains granular material, derived from the rapid degeneration of the tissues, and various species of microorganisms, usually cocci. If allowed to stand or decompose in an imperfectly drained abscess cavity, the pus will be found, moreover, teeming with the bacteria of putrefaction.

Varieties of Pus.—*Normal, healthy* (formerly called *laudable*) pus is best illustrated by that which is found in staphylococcic infections; it tends to remain localized, and the tissues from which it comes quickly recover after thorough drainage has been established. It is a greenish-white, creamy fluid, without odor, alkaline in reaction, and of a specific gravity of 1030. *Sanious* pus is mixed with blood, and is sometimes seen in caries and carcinoma. *Malignant or ichorous* pus is watery, acid, and very irritating to the tissues. *Blue* pus is due to the bacillus pyocyaneus, *orange* pus to hematoidin crystals the result of degeneration of red blood corpuscles, and *stinking* pus to the bacteria of putrefaction or the bacillus coli communis. *Concrete or fibrinous* pus contains flakes of lymph; *serous* pus, a large quantity of serum; and *muco-pus*, mucus. *Gas producing* pus is due to the bacteria of putrefaction, bacillus of malignant edema, bacillus aerogenes capsulatus, bacillus coli communis, or to communication with one of the air-containing viscera.

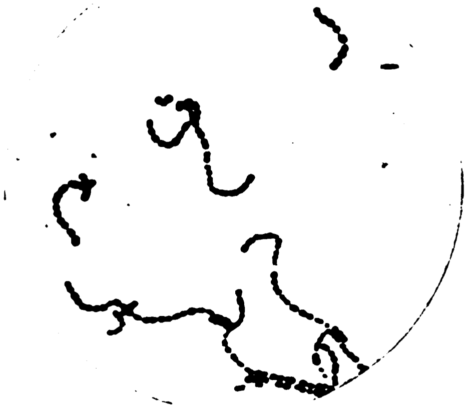
Tuberculous, scrofulous, caseous, or curdy pus, found in tuberculous processes, and *gummy* pus, the result of a degenerating gumma, are not, strictly speaking, pus.

The microorganisms that are most active in this process are the staphylococcus, the streptococcus, the gonococcus, and the bacillus pyocyaneus.

The Staphylococcus Pyogenes.—The varieties are staphylococcus pyogenes aureus, staphylococcus pyogenes citreus, and staphylococcus pyogenes albus. The staphylococcus pyogenes aureus is the one most commonly found in all cases of localized suppuration. The arrangement of the growth is in the shape of a bunch of grapes; hence the name "staphylococcus." These varieties of the staphylococcus grow upon artificial culture media, and from their chromogenic properties in this respect produce various colors: "aureus," orange or golden color; "citreus," lemon color; "albus," white color. The different forms are not motile and are without spores They stain with the ordinary watery or alcoholic solutions of anilin dyes and by Gram's method.



Staphylococcus Pyogenes Aureus, Pure Culture. × 1000.—(*Williams.*)



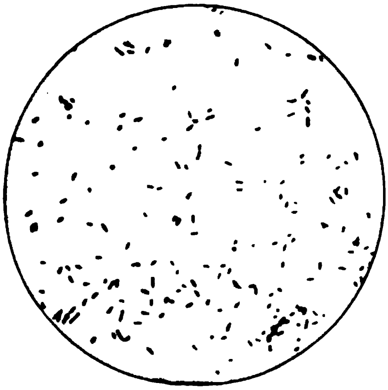
Streptococcus Pyogenes, from a Pure Culture. × 1000.—(*Williams.*)

Streptococcus Pyogenes.—In this variety of pyogenic cocci the arrangement of the organism in its growth is in the shape of chains; hence the name "streptococcus." While in the case of the staphylococcus the tendency is to produce a localized abscess, the streptococcus produces a suppurative process having a tendency to spread throughout the tissues. It is supposed to be one of the causes of erysipelas. The microorganism is not motile, and does not contain spores. It grows upon artificial culture media and stains with ordinary watery or alcoholic solutions of anilin dyes and by Gram's method.

The streptococcus erysipelatis is described under Erysipelas (*q. v.*).

The gonococcus was discovered by Neisser, in 1879, and is the cause of gonorrhea. These small hemispheric microorganisms are not motile, like other forms of cocci, and have no flagella and no spores. For many years attempts to cultivate this variety of bacteria upon artificial culture media proved futile, but after very painstaking effort it has been grown upon a mixture of human blood-serum and agar-agar. In the gonorrheal pus the microorganism is nearly always found in pairs within the epithelial cells. It stains best with rather weak, watery solutions of anilin dyes, but not by Gram's method. See Gonorrhea.

The bacillus pyocyaneus is a short, delicate bacillus of small size, frequently united in chains of 4 or 6. It has round ends, is actively motile, has one terminal flagellum, does not form spores, and is almost purely aerobic. It stains well with ordinary solutions, but does not retain the color by Gram's method. It is found in pus of a peculiar bluish or greenish color.



Bacillus Pyocyaneus.—*(Kolle and Wassermann.)*

Method of Staining for Staphylococci, Streptococci, and Gonococci.—Upon a perfectly clean cover-glass place a drop of the pus to be examined, and upon this place a similar cover-glass. Separate them horizontally, and dry in the air. With a pair of forceps grasp one edge of the cover-glass and pass through the flame of an alcohol lamp or Bunsen burner 3 times, each time allowing the specimen to occupy about 3 seconds in its passage through the flame. Upon this specimen then pour, by means of a pipet, a saturated aqueous or alcoholic solution in the case of streptococcus or staphylococcus pyogenes, but a weak, watery solution in case of gonococci of one of the anilin dyes, preferably methylene-blue, and allow it to remain for from 1/2 to 2 minutes; then rinse in water and mount in Canada balsam.

Gram's Method of Staining Bacteria.—Fix the specimen on a cover-glass. Instead of using the ordinary anilin dyes in alcoholic or watery solution, the following is used. It should always be freshly prepared (Ehrlich's solution):

Pure anilin,	4 gm.
Saturated alcoholic solution of gentian-violet,	11 gm.
Water,	100 c.c.

Grasp the prepared specimen with a pair of forceps, and pour upon it a few drops of the above solution and warm over the flame for from 2 to 5 minutes, constantly adding the solution. Remove and place in:

Iodin crystals,	1 gm.
Potassium iodid,	2 gm.
Water,	300 c.c.

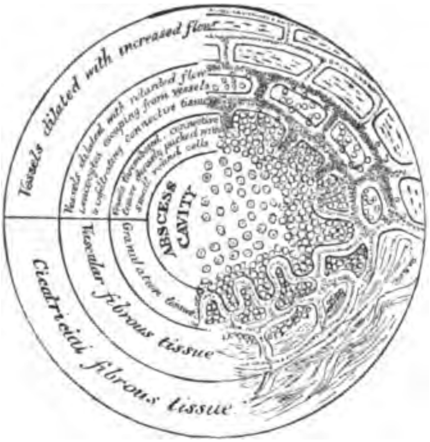
Allow the specimen to remain in this solution for from 2 to 5 minutes, wash in 95 percent alcohol, and counter-stain with eosin or Bismarck brown.

Circumscribed Suppuration or Abscess.—An abscess is "a circumscribed cavity of new formation containing pus." According to location, abscesses are named *dorsal, iliac, mammary, ischiorectal, perityphlitic, retropharyngeal, urethral,* etc. Abscesses are also known as superficial, deep-seated, acute or phlegmonous, chronic, common, specific, and residual.

An acute abscess is one that runs its course rapidly, and is always accompanied by well-marked inflammatory symptoms. It is, from its great frequency, one of the most important of surgical diseases. When an inflamed part becomes more heated and more swollen; when the skin assumes a dusky hue, and becomes glossy and shiny; when the pain, which has been of a dull, heavy nature, becomes persistent, steady, and throbbing, and when the skin over the swelling is edematous, then there can be no doubt that an abscess has formed.

Pathology.—In the formation of an abscess the first phenomena are those of inflammation, which have been described; when the production of embryonic tissue has been reached, if it stops at that point, resolution is established and recovery ensues; but should the new "cellular infiltrate" be invaded by any microorganism of suppuration, and a suitable soil for its nidus and growth be found, their excreta, known as ptomains, peptonize the fibrin and change the embryonic tissue to a liquid, which is pus. The changes here described begin in the lymph spaces, so that an abscess never has its commencement at a single focus; the accumulation of liquid and of cells causes the lymph spaces to be greatly distended; the fibrous tissues separating these spaces are widely pressed asunder, causing their supply of blood to be cut off, sloughing being the result; moreover, the living pus-cells find in these fibers a source of nourishment, and they are thus destroyed; hence the lymph spaces become converted into a single cavity, and an abscess is formed.

From the periphery to the center of an abscess all stages of inflammation are presented, from the first, which is the stage of congestion, to the last, which is the period of the formation of pus. Between these two conditions there is a middle point, when the inflammatory process has reached only the formation of embryonic tissue; and hence it is that the cavity of an abscess is always circumscribed by a tissue of new formation. Not only does an abscess extend in various directions, but all abscesses tend to empty themselves at the point of least resistance; they approach the surface, where they spontaneously evacuate themselves, their tendency being toward the skin. The abscess discharges itself by a small opening, which is due to the death of a limited portion of the skin. The contents of an acute or phlegmonous abscess are pus, micrococci, and some shreds of dead tissue. In some cases the abscesses contain air, when the contents are extremely fetid.


Vessels dilated with increased flow
Vessels dilated with retarded flow; leucocytes escaping from vessels & infiltrating connective tissue
connective tissue densely packed with small round cells
ABSCESS CAVITY
Vascular fibrous tissue
Granulation tissue
Cicatricial fibrous tissue

Diagrammatic Representation of the Minute Changes in the Formation and Healing of an Abscess.

The upper half shows abscess enlarging; the lower half abscess healing.—(*Walsham.*)

Phlegmonous abscess occurs in all periods of life and in all classes of persons; it varies in size, and is frequently found in subcutaneous connective tissue, in the muscular tissue, around the lymphatic glands, and around the bones. Its most common sites in the viscera are the liver and the brain.

Chronic Abscess.—The effect of the bacillus of tuberculosis on tissue is to produce a chronic inflammation, which results in the production of granulation tissue; this is the so-called pyogenic membrane of old authors, and acts as a protective wall to the surrounding tissue. The degenerative changes that take place are caused by local anemia and by the chemic action of the ptomains of the tubercle bacilli; they consist of caseation and liquefaction of the cheesy material. This purulent material has hitherto been looked upon as pus; it is now known to be tissue that has undergone metamorphosis. Pus is never present in a tubercular process unless the microorganism of suppuration is present, when there will be a mixed or double infection.

If the bacillus meets with a double resistance from the surrounding tissue, it exhausts the nutritive material in the granulations and dies; or it remains in a latent condition; the granulation is converted into a cicatricial tissue, and the local lesion is cured. This is designated spontaneous cure. The liquid may also be absorbed, when a similar favorable termination is possible. If the cavity is opened under antiseptic precautions, cure is accelerated; if, however, secondary infection with pus microbes takes place, the patient is in danger of septic infection as well as of local and general dissemination of the tubercular process.

Treatment of Abscess.—The chief indications are to remove the pus with as little injury to the tissues as possible, to insure sufficient drainage, and to maintain the parts in an aseptic condition. When it is evident that suppuration must ensue, it should be promoted by moist warmth in the form of a large boric acid poultice sprinkled with opium or hot poppy fomentations. As soon as fluctuation is detected, the abscesses should be opened by making a free incision in the most dependent part or where it is pointing, of course taking care to avoid blood-vessels or other important structures in the neighborhood. The pus should generally be allowed to flow out of its own accord. To insure thorough drainage, and to prevent any tension from reaccumulation, the opening should be free and a drainage-tube should be inserted. If the abscess is large, a counteropening may be necessary, or the abscess cavity may degenerate into a sinus. If the drainage is efficient, no harm will ensue if a poultice—the favorite treatment of the older surgeons—is applied; but if the abscess is deep and the aperture small, and there is thus danger of the pus being retained and undergoing decomposition, antiseptic dressings or boric acid fomentations should be used, as under these circumstances the retained discharge will probably be under some degree of tension, and the granulation walls of the abscess hence inefficient to prevent absorption. Although it is a rule in surgery to open an abscess as soon as fluctuation clearly shows that pus has formed, there are some instances in which this is especially imperative. Thus, an abscess should be opened at once when it is situated in the perineum, in the abdominal or thoracic walls, in the sheath of a tendon, under a deep fascia or the peritoneum, in the orbit, near a joint, and in the neck if attended by dyspnea; when obstructing some passage; when caused by the infiltration of urine, feces, etc., and when a spontaneous opening would produce deformity.

Hilton's method, as it is called, of opening an abscess is very useful when the abscess is situated deeply and among important structures, as at the root of the neck or in the axilla. It consists of making an incision through the skin and fascia and then working gently in the direction of the pus with a director. As soon as pus presents, a pair of dressing forceps are slid along the groove of the director into the abscess cavity, the director is removed, and the blades of the forceps are separated so as to stretch the opening and make a free exit for the pus.

The complications of acute abscess are: (1) Hemorrhage from the involvement of a large vessel; (2) the implication of some important part, as the peritoneal cavity, the interior of a joint, etc.; (3) degeneration into a sinus or fistula; (4) blood-poisoning (sapremia, pyemia).

The chronic abscess must not be allowed to open itself spontaneously. This precaution is to be particularly borne in mind when the glands of the neck are affected. Open the abscess in the most dependent portions, using a straight, sharp bistoury for the purpose; press out the accumulated material; scrape out the abscess thoroughly; wash it with an antiseptic solution of bichlorid of mercury, then bring the opening together by means of a suture; insert a drainage-tube and place iodoform gauze upon the outside. Before opening an abscess of large size, and after ether has been administered, give 1/6 grain of morphin, hypodermically, and also administer 1/6 grain of opium every 8 hours. The effect of opium is to prevent capillary hemorrhage after the removal of pressure.

Constitutional Treatment.—When the suppuration is profuse, tonics—such as iron, quinin, and strychnin—together with good, nutritious diet, milk-punch, etc., and change of air, must be insisted upon.

To repair waste from suppuration:

℞. Syrup of iron, quinin, and strychnin, ℥ vj.
A teaspoonful in water thrice daily.

℞. Syrup of hypophosphites, ℥ vj.
A dessertspoonful thrice daily.

The injection of bacterial vaccines although at one time recommended, has not proved of so much value in the treatment of abscess as it has in superficial infections such as furuncles. In fact it is probably worthless, and at most is uncertain and unsatisfactory. If employed at all it should be used only as a supplement to surgical and general medicinal measures. See VACCINE THERAPY.

See BRAIN (Inflammation), HECTIC FEVER, LIVER (Abscess), PSOAS ABSCESS, SPINE (Caries), Sepsis etc.

Diffuse suppuration may occur either in the substance of tissues or organs, or on the surface of the skin or of the mucous or serous membranes. An example of the former is cellular erysipelas. Examples of the latter are seen in gonorrhea, bronchitis, and peritonitis. These affections are all discussed under their separate headings.

SUPRARENAL DISEASE (Addison's Disease; Adrenal Disease).—A well-marked, constitutional disease, exhibiting itself locally as a chronic inflammation of the suprarenal capsules, but in its essence consisting of a peculiar anemic condition, always tending toward death; and which is characterized by intense development of pigment in the cells of the rete malpighii and in the epithelium of the mucous membrance of the mouth.

The etiology is obscure. Tubercle, scrofula, and syphilis have each been given as the cause.

Pathologic Anatomy.—A low form of inflammation, terminating in degeneration of the suprarenal capsule. The blood is deficient in fibrin and red corpuscles, with a slight increase of the white corpuscles. Fatty degeneration of the heart and vessels has been observed in some cases. The most striking change during life—the abnormal pigmentation—is due to the deposition of granular pigment in the cells of the rete malpighii, in the papillary portion of the cutis, and even in the connective-tissue corpuscles. No change occurs in the proper structure of the skin. Similar pigment deposits occur in the mucous membrane of the mouth, especially along the edges of the teeth. The disease of the suprarenal capsules excites an irritation of the vasomotor system—the trophic system—that leads to the pigmentation.

Symptoms.—The onset of the disease is insidious, with a feeling of extreme languor, muscular fatigue, asthenia, indigestion, anorexia, dyspnea, cardiac palpitation, vertigo, melancholia, and excessive drowsiness. The surface is first pale, then changes to a hue like that seen in melancholia, changing to icteroid, finally resembling the color of a mulatto, and then to a lusterless bronze. These changes also occur on the mucous membrane of the lips, tongue, gums, and mouth.

Prognosis.—The disease is incurable. The duration is 1 or 2 years.

Treatment is symptomatic, and is of little use. Arsenic and cod-liver oil give the best results. Iron and other tonics are useful, especially a combination of the chlorid of iron, glycerin, and chloroform. Phosphorus has seemed to exert a beneficial influence. Adrenal extract has been employed in a few cases, with some benefit while used.

℞. Tincture of iron chlorid,
Spirit of chloroform, } each, ℥ j
Glycerin, ℥ vj.
A dessertspoonful in water thrice daily.

SUPRARENAL EXTRACT (Adrenal Extract).—The selected dried and powdered suprarenal capsules of oxen and sheep. One part of this powder represents 5 parts of the fresh organ. Systemically, its effects are principally on the circulatory and nervous systems. It is a remarkable astringent, and is much used in operations upon the eye, ear, nose, and throat and in the treatment of local congestions, inflammations and hemorrhages, especially of the eye, ear, nose and throat. When applied to any mucous surface, it produces more or less profound ischemia, depending on the strength of the solution and the manner and time of application. Locally applied, it is never followed by any constitititutional manifestations. The bloodless condition of the mucosa is unmistakably due to the local action of the extract on the vasoconstrictors of the capillaries, constricting them and inducing bleaching of the surface. No injurious effects to the tissue follow the continuous application, nor is there any danger of contracting a habit, as the action of the adrenal extract is purely local on mucous surfaces, no absorption taking place sufficient to produce any evidence of constitutional effects. The pupil, accommodation, and intraocular tension are in no way affected. It has absolutely no action on the skin, nor does it possess any anesthetic properties wherever applied. Its action is wholly but strongly astringent; hence its efficacy in preventing hemorrhage during an operative procedure on mucous membranes. The depletion is complete. Maurange first recommended it for the prevention of hemorrhage in eye operations. Its local effects are enhanced by a preceding application of cocain or antipyrin solution. When applied locally for either therapeutic or operative purposes, it should always be preceded by a 5 percent solution of cocain, so as to secure the combined anesthetic and enhanced effects of the cocain and extract. The adrenal capsule has of itself no anesthetic properties, being purely astringent, and then only when applied to the mucous surfaces. The astringent action begins in from 30 to 40 seconds, and lasts from 1/2 of an hour to 3 hours, after which interval the mucous membrane returns to its normal condition. The solution of the capsule is not at all irritating, but rather imparts a cooling sensation to the conjunctiva.

A preparation made by placing 5 grains of desiccated suprarenals in 1 dram of cold, saturated boric acid solution and allowing the mixture to stand 10 minutes before filtering, applied locally, relieves congested mucous membrane, and prevents hemorrhage, thus enhancing and prolonging cocain anesthesia. Its full effect is noticed in a few seconds, and lasts from 1 to 2 hours. The extract is not antiseptic nor anesthetic, and no tolerance is established by its use. Fresh solutions should be prepared for each operation. Powdered desiccated suprarenal capsules of the sheep, 1 grain representing 8 grains of the fresh substance, in ounce bottles, are for sale.

Internally, suprarenal extract has been given with great benefit in shock and hay-fever. It has been used in Addison's disease, pernicious anemia, diabetes insipidus, diabetes mellitus, cyclic albuminuria, and heart disease, in doses of from 3 to 5 grains, 2 or 3 times daily. This extract has given good results in nasal, pulmonary and gastric hemorrhage, acute and chronic bronchitis, bronchial asthma, congestion and edema of the lungs, edema of the glottis and diabetes insipidus. It will be found useful in chronic muscular affections, especially those involving loss of tone or degenerative changes, and will probably be found valuable in all conditions in which the vasomotor tone is impaired. Being a powerful but temporary stimulant of the heart it may be used cautiously in cardiac weakness, in failure of the heart from any cause and in valvular diseases of that organ.

By local application the angiostenotic properties of suprenal extract have been successfully utilized in the treatment of local congestions, inflammations and hemorrhages, especially those of the eye, ear, nose and throat. It is an excellent hemostatic for hemorrhage following operations on the nose, and is used as an application to inflamed tissues prior to their being anesthetized by cocain, also to the mucous membrane of the turbinated bodies in ulceration or hypertrophy thereof.

Suprarenaden is a preparation made from the suprarenal capsules, used in Addison's disease, menopause, neurasthenia, and diabetes insipidus. Dose, 15 to 23 grains daily. See ADRENALIN.

SUSPENDED ANIMATION.—See ASPHYXIA; SYNCOPE.

SUSPENSION.—A mode of treatment of certain diseases, especially tabes dorsalis, in which the patient is so placed that the whole weight of the body hangs upon the neck, the head being supported at the chin and the occiput. The stretching of the spinal cord sometimes removes the morbid process in a manner at present not well understood. See SPINE (Diseases).

SUTURE.—A stitch used in closing the edges of a wound. Suture material may be of silk, silkworm-gut, catgut, or other animal material, and of metal. See LIGATURE.

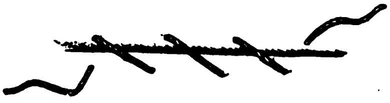
The Interrupted Suture.—The needle, carrying a single ligature, is passed through the skin on one side of the wound from without inward, and is then inserted from within outward at the corresponding point on the opposite side of the wound. The ends of the ligature are drawn together and tied tightly in a double knot. The ligature is then cut and another suture introduced at an interval of 1/2 of an inch, and so on.

Lembert's interrupted suture is recommended in wounds of the intestines. The stitches should be 3/8 of an inch from the margin of the wound, the middle suture being first introduced; the distance between the sutures should not exceed 1/4 inch. When the requisite sutures have been applied, the ends are to be tied, and cut off close to the knot. The bowel is then returned to the abdominal cavity and a glass drainage-tube inserted.

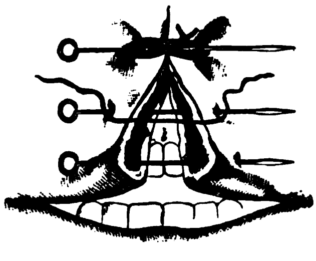
The Twisted or Harelip Suture.—Having placed the edges of the wound accurately in contact, a sufficient number of needles are passed through the edges of the wound. When the necessary number of needles have been introduced and the parts have been accurately adjusted, the middle of the long ligature is twisted around the uppermost needle in the form of a figure ∞. Then the two ends of the ligature are brought down and twisted around the other needles successively, when they are secured by a knot. After insertion the points of the needles must be cut off with pliers. The upper pin must be removed at the end of the second day, and the lower pin at the end of the third day.

The Glover's or Continuous Suture.—This suture is employed in wounds of the intestines and abdomen. It is applicable to cases of injury of great extent when there is tendency to the escape of fecal matter in the intervals between stitches. It is merely the ordinary stitch employed for sewing materials together; it is made by simply passing the needles diagonally from one side of the wound to the other.

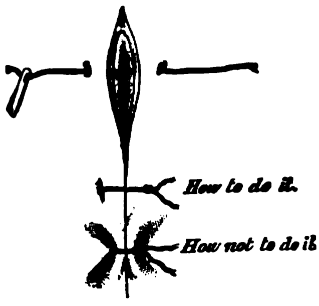
The figures on the next two pages illustrate the principal sutures.



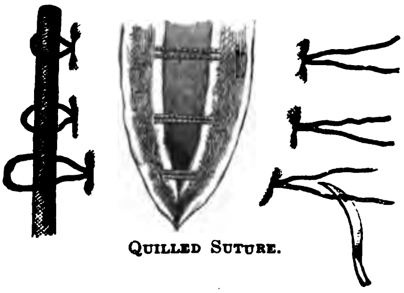
Continuous Suture.



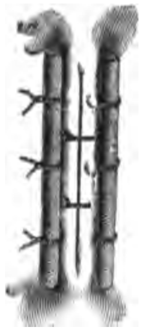
Harelip Suture.



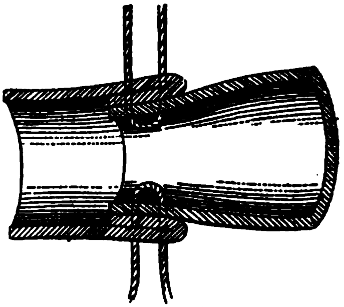
Interrupted Suture.



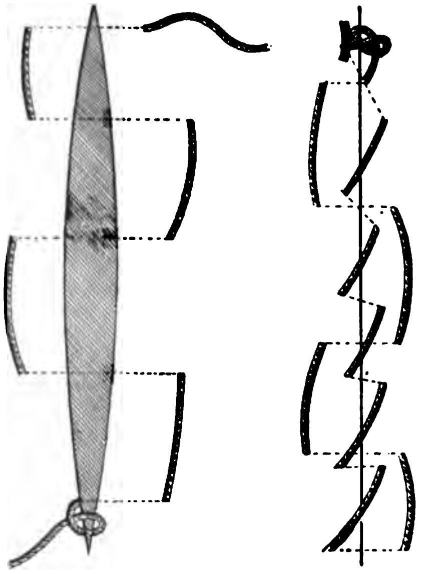
Quilled Suture.



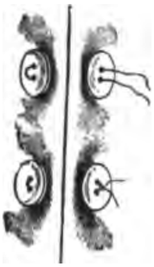
Quilled Suture.



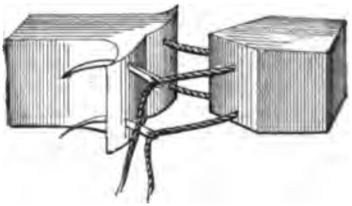
Jobert's Suture.



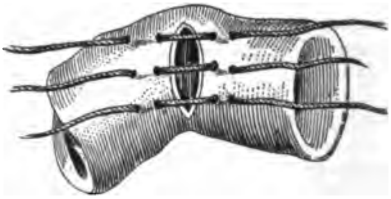
A Quilted Sutures. B



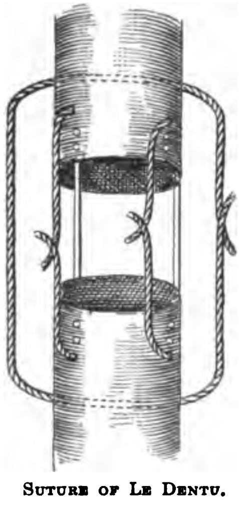
Button Suture.



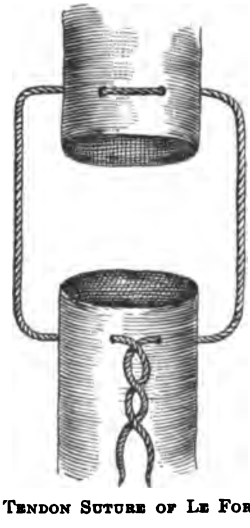
Tongue and Groove Suture.



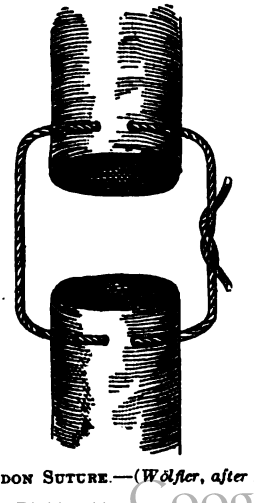
Lembert's Suture.



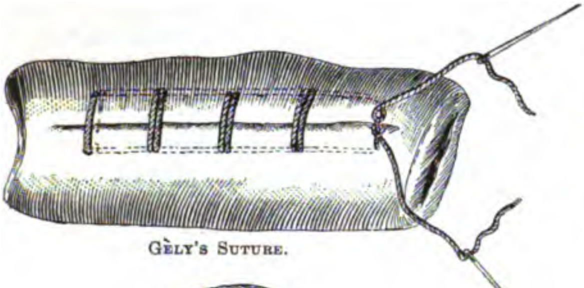
Suture of Le Dentu.



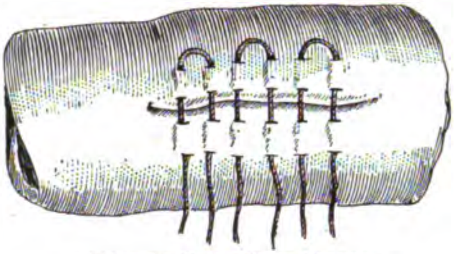
Tendon Suture of Le Fort.



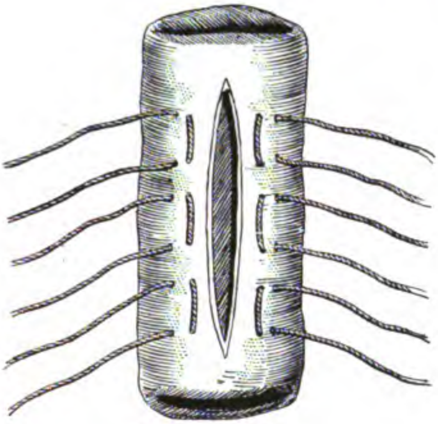
Tendon Suture.—(*Wölfler, after Lejars.*)



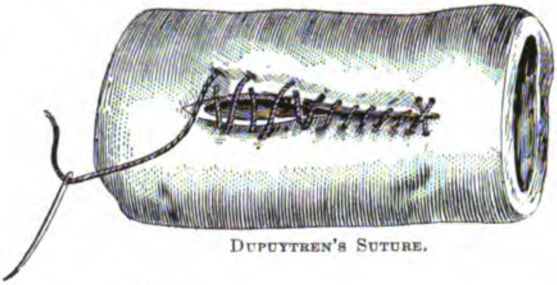
Gèly's Suture.



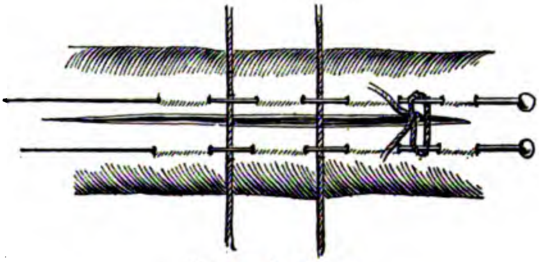
Halsted's Plain Quilt Suture.



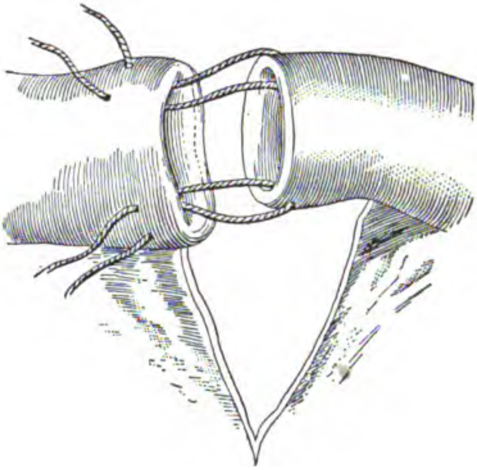
Emmet's Method.



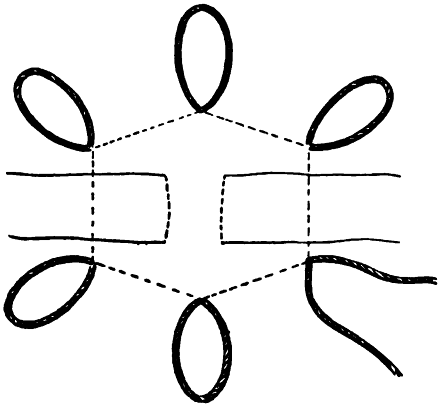
Dupuytren's Suture.



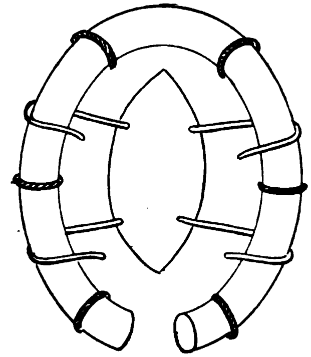
Bouisson's Suture



Jobert's Invagination Suture



A
Sutures for Immediate Gastrostomy.



B
Sutures for Immediate Gastrostomy.

SWALLOWING, DIFFICULT.—See Dysphagia.

SWEAT-GLANDS, DISEASES.

Hyperhidrosis (Excessive Sweating).

A functional disorder of the sweat-glands characterized by an excessive secretion of sweat. The affection may be general or local.

Symptoms.—The hands, when affected, are cold and clammy. In severe cases the sweat drops from the palms, incapacitating the patient from all manual work. The feet, when affected, become tender, so that walking produces pain. The soles are reddened and the epidermis is macerated.

Etiology.—General hyperhidrosis results from faulty innervation. It may, however, be physiologic, as during violent muscular exertion. The local forms are probably due to some disturbance of the vasomotor apparatus.

Treatment.—In general hyperhidrosis constitutional remedies are to be employed—belladonna or atropin, ergot, nux vomica, mineral acids, quinin, etc. Crocker speaks highly of sulphur, given in 1-dram doses twice daily, for both general and local sweating. For the local forms the remedies are, for the greater part, to be applied to the affected regions. Upon the palms this condition is much more refractory to treatment than upon the soles. The following prescription will be found of great value in the treatment of sweating feet:

℞.	Salicylic acid,	gr. xx
	Boric acid,	ʒ j
	Lanolin, Petrolatum, } each,	℥ ss.

To be rubbed in well at bedtime.

The feet should not be washed more than once a week. It is well also to place boric acid in the stockings. Hebra's plan was to wrap up the feet in diachylon ointment, and continue the treatment for a fortnight. Crocker recommends the use of belladonna ointment. All of these remedies will be found more efficient in sweating feet than in sweating hands. To check sweating of the axillæ apply, for a few hours, a sponge soaked in very hot water. Faradization and galvanization are sometimes of value in hyperhidrosis.

Bromidrosis (Osmidrosis).

A functional disorder of the sweat-glands, characterized by sweat secretion of an offensive odor. The condition may be symptomatic, as in uremia, rheumatism, etc. There is usually an excessive sweating, although the amount may be normal. The odor is often so unpleasant as to unfit the sufferer for society. The etiology is obscure. It usually occurs upon the feet of young persons. The sweat is not offensive when secreted, but soon becomes so from the action of microorganisms. The treatment is practically that of hyperhidrosis.

Anhidrosis.

A disorder of the sweat-glands characterized by diminution or suppression of sweat.

It may be symptomatic, as in diabetes, fevers, etc. It may also be due to faulty innervation. There may be but slight diminution of sweat secretion or total absence. In congenital cases no treatment is of avail. In acquired cases one may employ massage, electricity, vapor and alkaline baths, etc.

Chromidrosis.

A disorder of the sweat-glands characterized by colored sweat. There are two forms—idiopathic and accidental (color due to certain substances taken into the system). The color in the idiopathic form is usually black or sepia. The orbital region is usually affected.

Accidental Forms.—Green sweat is found frequently in copper workers. Red sweat, which occurs often in the axillæ, is due to the action of the bacterium prodigiosum, and is often associated with leptothrix.

The treatment is based upon broad general principles.

Uridrosis.

A condition characterized by the excretion through the sweat-glands of constituents of the urine in considerable quantity. The sweat normally contains small quantities of urea. In suppression of the urine, as in Bright's disease, cholera, etc., urinary products are eliminated through the sweat-glands. There is a urinous odor to the skin, and sometimes a deposition of salts on the skin.

Hematidrosis (Bloody Sweat).

A condition characterized by hemorrhage from the sweat-pores.

The affection is very rare. It occurs in young hysteric women. It has been observed on the face, ears, umbilicus, hands and feet.

Sudamen (Miliaria Crystallina).

An eruption characterized by the formation of numerous superficial, pinhead-sized, transparent vesicles, occurring during the course of febrile diseases. The vesicles are noninflammatory. They have been aptly described as resembling "dewdrops." They are most abundant upon the trunk and neck, and disappear in the course of a few days. The vesicles are due to a collection of sweat in the upper layers of the epidermis, as a result of obstruction of the sweat-ducts. The affection undergoes spontaneous involution.

Miliaria (Prickly Heat).

A mild inflammatory affection, caused by obstruction of the sweat-ducts, characterized by the occurrence of small papules and vesicles at their mouths.

Symptoms.—The affection comes on suddenly, after profuse perspiration. The lesions are discrete, never tending to coalesce. Itching is usually present. The trunk is the seat of predilection. In children it is likely to be complicated by furunculosis.

Pathology.—Obstruction of sweat-ducts, with surrounding inflammation.

Treatment.—Prophylactic. Children should be lightly clad in thin woolens and kept out of the heat. Constipation should be avoided. Sedative lotions and dusting-powders constitute the local treatment. The following is a useful combination:

℞.	Phenol,	♏ xxx
	Boric acid,	ʒ j
	Zinc oxid,	ʒ jss
	Glycerin,	ʒ ij
	Alcohol,	℥ ij
	Water, add enough to make,	℥ vj.

Sop on the skin as indicated.

Or a dusting-powder may be used:

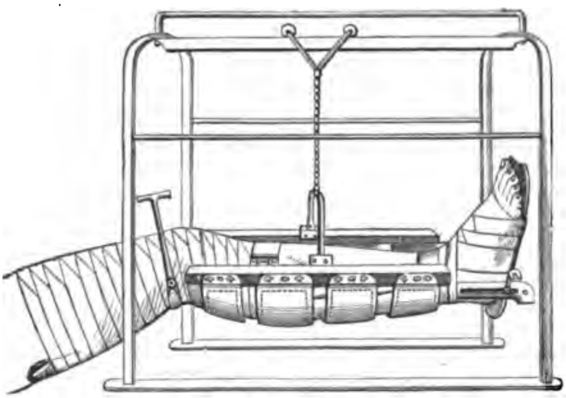
℞.	Magnesium carbonate, Boric acid, Powdered starch,	each, ʒ ij.

An excellent method is to sop on a saturated solution of boric acid, and follow this with a dusting-powder. When the entire body is involved, bran, starch, or alkaline baths may be employed with good results.

SWEATING SICKNESS.—See Miliary Fever.

SWEET OIL.—See Olive Oil.

SWING.—An apparatus consisting of a cradle that moves on wheels along a horizontal bar on an iron framework; it is used in the treatment of fractures of the lower extremities.



Salter's Swing.

SWOONING.—See Syncope.

SYCOSIS.—Chronic inflammatory disease of the hair follicles, usually of the bearded region, characterised by papules, pustules, and tubercles perforated by hairs.

Symptoms.—The disease commences by the formation of discrete pinhead-sized to pea-sized papules or pustules at the sites of hair follicles. The pustules are flat or acuminated, and contain a yellowish fluid; they show no disposition to rupture, but dry into crusts. The surrounding skin is reddened, sometimes swollen and infiltrated, and is the seat of a variable amount of itching, burning, and pain. The pustules are discrete, but may be closely aggregated. A hair perforates the center of each lesion. In the beginning the hair is firmly attached; but as suppuration becomes free, it is more easily extracted. At times tubercles are present. The eruption comes out in crops, the disease lasting for months, or even for years. The affection is confined to hairy regions, particularly the beard and mustache.

Etiology.—The disease obviously occurs only in adult males. It is due to invasion of the follicles by microorganisms, chiefly the staphylococci aureus, citreus, and albus. Nasal discharge may produce a sycosis of the upper lip.

Pathology.—The pathologic process consists of a folliculitis and perifolliculitis, due to pyogenic cocci. The inflammation is at first perifollicular, the follicle only becoming secondarily invaded by serum and pus.

Diagnosis.—Sycosis vulgaris may be confounded with tinea sycosis and pustular eczema. The differential diagnosis is appended:

Sycosis.	Tinea Sycosis.
1. A typical case shows small discrete papules or pustules pierced by hairs.	1. A typical case shows large, lumpy, or nodular tumefactions.
2. Hairs firmly attached until free suppuration occurs. Roots often swollen with pus.	2. Hairs broken and easily extracted. Roots usually dry.
3. Course slow. Little change from week to week.	3. Course rapid. Marked changes from week to week.
4. Mustache frequently affected.	4. Mustache practically never affected.
5. Absence of fungus in hairs.	5. Trichophyton fungus in hairs.

Sycosis.	Eczema Pustulosum.
1. Lesions strictly follicular, pierced by hairs.	1. Lesions likely to be interfollicular as well.
2. Eruption limited to bearded region.	2. Tends to spread upon nonhairy regions.
3. Absence of oozing.	3. Oozing marked.
4. Itching slight.	4. Itching more severe.

Prognosis.—Very few cases are incurable. The disease, however, is often refractory to treatment, and lasts months or years. Recurrences are common.

Treatment.—Internal remedies, such as iron, arsenic, cod-liver oil, etc., are at times indicated by the general condition of the patient.

External treatment, however, is far more important. An essential step in the local treatment is the systematic shaving or clipping of the hairs. The beard should be closely clipped with scissors, or, better still, shaved every 2 or 3 days. When suppuration is free, daily depilation should be practised.

When the inflammatory signs are marked, soothing lotions—such as lotio nigra or saturated solution of boric acid, or ointment of cold cream, oxid of zinc ointment, etc.—may be employed. Most cases, however, require more stimulating applications.

As in most follicular inflammations, sulphur is of great value here. It is best employed in salve form, although lotions may also be used:

℞. Precipitated sulphur, gr. xxx to ʒ j
Petrolatum, ℥ j.

A mercurial ointment often acts efficiently:

℞. Ammoniated mercury, gr. xv to xxx
Petrolatum, ℥ j.

The following formula is highly spoken of:

℞. Ichthyol, ʒ j to ij
Petrolatum, ℥ j.

A lotion of bichlorid of mercury, 1/4 to 1 grain to the ounce, sopped on frequently, is often followed by good results.

Ichthyol is of value especially when introduced by cataphoresis, a 10 percent solution at the cathode. Pyoktanin introduced in the same way is also advocated. Sodium sulphite in solution with glycerin and water applied locally is recommended. Copper sulphate as a lotion combined with zinc sulphate is highly praised. The X-rays have proved efficacious.

SYMPATHETIC OPHTHALMIA.—An inflammation of the ciliary body, iris, or choroid, or a combined inflammation of any or all of these in one eye, due to injury in the other eye.

Cause.—The usual cause is an injury to the ciliary body, or incarceration of the ciliary body and iris in a scleral wound. A foreign body in one eye, causing cyclitis, is often followed by sympathetic inflammation in its fellow. The manner in which sympathetic inflammation is produced is not clearly understood. Mackenzie supposed that sympathetic inflammation passed from the retina of the injured eye through the chiasm, to the retina of the other eye. Deutschmann suggested that germs travel along the optic sheath through the chiasm into the sheath of the opposite nerve, and thence into the eye. Bacteriologic infection of the sympathetically affected eye can rarely be proved. A more recent theory is that the path of irritation is from the first eye through the ciliary nerve to the ciliary ganglion; through the sympathetic root of the latter to the carotid plexus of the same side; then through the circle of Willis to the carotid plexus of the other side; and then in a centrifugal direction to the ciliary ganglion and the ciliary nerves of the second side. The time of outbreak of the secondary attack varies from 4 to 8 weeks after the original lesion, but cases have been reported from 2 weeks to 40 years afterward.

Symptoms and Diagnosis.—The premonitory symptoms are those of **sympathetic irritation**—asthenopia, photophobia, lacrimation, reduced accommodation, cloudy vision, and a mild pericorneal injection. The aqueous may be moderately opaque and the disc slightly reddened. As the stage of true **sympathetic inflammation** ensues, signs of inflammation corresponding to exacerbations of inflammation in the exciting eye are noticed. The ciliary region becomes extremely tender; cyclitis, iritis, or some form of keratitis becomes visible. The pain and cloudiness increase, and the visual acuity steadily diminishes. Synechiæ may form, and the intraocular tension becomes at first increased, and afterward diminished, as atrophy begins. It is the rule, after varying improvement and relapse, to find an adherent iris, cataractous lens, or atrophied globe from deficiency in vitreous, causing retinal prolapses and incurable blindness, despite all treatment. However, it is possible to retain some indistinct vision in favorable cases; but the process is always prone to relapse, and the inevitable result follows.

Treatment is preventive, and must interrupt the nervous connection between the eye first involved and the one showing signs of sympathetic inflammation. It has been suggested that this be accomplished by cutting the ciliary nerves. Several different methods have been proposed, one of which is to cut completely through the optic nerve, expose the posterior pole of the eyeball, and cut the ciliary nerves entering at this location. Evisceration has also been proposed. The only certain method of prevention and cure is **enucleation of the eye first affected.** This is so important a subject that the concise rules laid down by Fick are given here as a guide:

1. If the first eye is blind, painful, and sensitive to pressure, enucleation is to be advised; it is to be urged if the patient lives a distance from a surgeon, and thus may be in danger of overlooking the beginning of sympathetic inflammation. If the patient will not consent to the operation, he should be told to seek aid at the first sign of visual disturbance or of inflammation in the other eye.

2. If the first eye has a foreign body in it, and is painful and sensitive to pressure, enucleation should be urged, even if the eye sees; it is to be supposed, of course, that the foreign body cannot be removed independently.

3. If the sympathetic inflammation, or even irritation, appears in the second eye, the first must be enucleated at once. If the first eye is not blind, but still retains a certain visual acuity, and is to some extent quiet, both patient and surgeon will hesitate at such radical proceedings. There is, however, no general rule for such a case. The visual acuity of the first eye must be carefully compared with the degree of irritation in the second; the more there remains to rescue in the second eye, the greater price can be paid by the first.

If the sympathetic inflammation is fully developed, enucleation proves of litte value, and the pain must be lessened by cocain, atropin, warm compresses, and bandages, and the patient must be confined to bed. Mercurial inunctions and subconjunctival sublimate injections have been advised; iodids and mercurials may be given orally; but despite all treatment, the eye is generally lost.

SYMPHYSEOTOMY.—The subcutaneous separation of the symphysis pubis for the purpose of enlarging the pelvic diameters. The maximum degree of separation of the pubic bones is 7 cm. if injury to the sacroiliac joints is to be avoided. By this amount of separation there is gained in the true conjugate diameter 1.5 cm.; in the oblique diameter, 3.5 cm.; and in the transverse diameter, 3 cm. By this means safe delivery is secured, which under ordinary circumstances would be impossible.

Indications.—The operation is indicated in certain degrees of contracted pelvis. Unless the child is below the average size, it should not be attempted if the true conjugate measures less than 7 cm. Ordinarily, it would not be necessary with a conjugate above 8 cm. A rigid, nondilatable cervix would contraindicate the operation, as would also a narrow, contracted vagina. Marked varicose condition of the veins about the symphysis and vulva might give rise to dangerous hemorrhage.

Technic.—The steps of the operation are as follows:

1. The patient is thoroughly prepared for the operation, anesthetized, and placed in the lithotomy position.
2. A metallic catheter is passed into the urethra and pressed downward and to the right, so that injury to this structure may be avoided.
3. An incision, about 2 inches in length, is made in the median line just above the symphysis.
4. The incision is carried down through the fascia and the attachments of the recti muscles, separated sufficiently to permit the introduction of the index-finger along the posterior surface of the symphysis.
5. Using the left index-finger as a guide, the Galbiati knife is hooked under the symphysis, inclined a little to the left, and by a sawing or rocking movement the joint is divided from below upward and from within outward. If the joint does not separate, the knife should be reintroduced and the subpubic ligament divided.
6. To prevent too great a separation of the joint, the trochanters should be supported by assistants. Hemorrage is usually profuse, but can be controlled by plugging the wound with gauze.
7. The catheter is now removed, and the child is delivered with forceps if engagement has occurred; by version, if it has not.
8. The wound is now united with a few interrupted sutures of silkworm-gut, and a firm pelvic binder is applied.

The patient remains in bed for 4 or 5 weeks. To secure union of the joint, she should remain upon her back with the limbs closely approximated. This position is best secured by a specially arranged trough-shaped bed, or hammock, or by the use of sand-bags extending from the axilla to the ankle.

Prognosis.—The maternal mortality of symphyseotomy at the present day is about 10 percent On account of the close approximation of the limbs it is difficult to keep the parts perfectly free from the discharges. This, and the fact that the wound is so close to the genitalia, favor the development of sepsis after the operation. There may be some difficulty in walking, but this soon disappears. The rapid extraction of the child also favors injury to the soft parts. The infantile mortality is about 20 percent.

SYNCOPE.—A swooning or fainting. A partial or complete temporary suspension of the functions of respiration and circulation.

Causes.—Syncope may be due to a condition which interferes with the action of the heart, either intrinsically, through the nervous system, through the blood, or through more than one of these channels.

When intrinsic, cardiac complications, especially fatty degeneration, may be causative. Compression of the heart from diseased conditions or by tight articles of dress, excessive natural or artificial heat, or certain drugs or poisons may be provocative of syncope. The most common nervous cause is uncontrolled emotion, such as fear, joy, or grief. The reflexes are also sources of provocation, from the effects of irritant or intestinal poisons, worms, scybala, etc. Of the causes connected with the blood, that of hemorrhage is the most common, while chronic anemia and chlorosis are often accompanied by it.

Fainting also occurs from hunger and starvation, railway shocks, grief, painful lesions, and cerebral concussion. Fainting from overheated air is partly due to the direct effect of heat upon the circulation, partly to interference with respiration, and partly to the effect on the heart of carbonic acid and other excrementory products.

The duration of the several stages of shock varies from a few seconds to hours.

Prognosis.—The most common termination is recovery, but death may occur.

Fatal syncope has occurred at the height of an attack of diphtheria and in chronic valvular heart-disease, while there is a tendency to syncope in myocardial disease. Death by syncope may follow hemorrhage or may be due to thrombosis or embolism of the pulmonary artery or to pneumothorax. Sudden and fatal syncope from serofibrinous effusion in acute pleurisy may be induced by such slight exertion as getting out of bed.

Diagnosis.—Syncope must be differentiated from apoplexy, from concussion of the brain, from shock, and from poisoning of many kinds, including poisoning by gases and by alcoholic liquors. The character of the pulse will distinguish between those conditons which have their origin in the brain and those from poisoning (unless due to poisoning by heart depressants). Hysteric faints, not cardiac, are readily diagnosed by the pulse, which is of good volume and force in these cases. Shock usually produces a degree of syncope. See SHOCK, COMA (Treatment). Two indications are to be met: (1) The removal of the cause of the faintness, and (2) the restoration of the action of the heart. The patient should be placed flat on the back, and all neck or chest constriction, from clothing or otherwise, removed. The atmosphere should be as pure as can be obtained by throwing open windows, doors, etc., or by removal to the open air. Any causative hemorrhage must be checked, and any other cause must be removed. Cardiac stimulants are to be employed. Alcohol, as brandy, whisky, or strong wine, may be given, and ammonia or smelling salts should be inhaled. Cold water may be dashed over the face. Amyl nitrite is very efficacious in anemic subjects. Atropin hypodermically, 1/100 to 1/60 of a grain, is a valuable remedy. The oil of cinnamon is a powerful stimulant. Ticture of nux vomica in 5-minim doses is of benefit in extreme cases of cardiac syncope approaching heart failure. The compound tincture of lavender is stimulating and effective. Galvanization to the pneumogastric nerve, if practicable, is recommended, but still better is the electric brush swept over the abdomen and chest. Artificial Respiration (*q. v.*) is not to be neglected. Most cases will revive spontaneously.

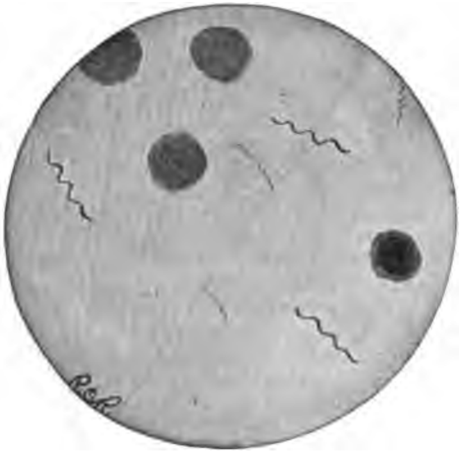
SYNDACTYLISM.—See Webbed Fingers.

SYNOVITIS.—See Joints (Diseases), Joints (Injuries).

SYPHILIS. Synonyms.—Lues venerea; morbus gallicus; pox; "bad disorder." Fr., *Vérole.* Ital., *Sifilide.* Ger., *Lustseuche; Krankheiten der Französen.* Span., *Sifilis.* Swed., *Radezyge.*

Definition.—Syphilis is a general infectious disorder, transmitted from one individual to another both by contact and inheritance, chronic in course, and displaying a more or less determinate sequence involving one or several of the organs of the body. It is classed with the infective granulomata, and it is due to the toxic effect of the invasion of the bodily tissues by a morbific germ.

Etiology.—The spirochæta pallida or treponema pallidum of Schaudinn is in all probability the cause. This work of Schaudinn has been confirmed by Metchnikoff and other observers. Schaudinn considers that the spirochæta pallida (treponema pallidum) belongs to the protozoa rather than to the bacteria and therefore must not be classed with the spirilla. It is found in the primary and secondary lesions of acquired syphilis and in the organs of a congenitally syphilitic child, and has been demonstrated in the blood stream. For its inoculation a raw surface or abrasion is required. The infection is usually transmitted through the secretions of the primary or secondary lesions, but sometimes through the blood of the syphilitic patient. It is probable that the tertiary lesions are also capable of conferring the disease. Normal secretions unless contaminated with secretions of the lesions are not infectious. The disease may be transmitted, however, by the spermatozoa or ova of syphilitic patients.



The Spirochæta refringens is the larger and more darkly stained organism, while the lightly stained and more delicate parasite is the Spirochæta pallida (*Treponema pallidum*). From a chancre stained with Wright's blood stain.—(*Hirsch—by Rosenberger.*)

Though the majority of cases of acquired syphilis result from sexual intercourse, the infection may be conveyed by drinking utensils, infected hands, lips, or by handling infected patients. The syphilitic child may infect the wet-nurse. Rarely the disease has been acquired by vaccination.

The Spirochæta Pallida.—This organism does not readily take up anilin dyes. A reliable stain for it is the Giemsa stain, freshly prepared: 12 c.c. of eosin solution (2.5 c.c. of 1 percent eosin solution in 500 c.c. of water); 3 c.c. of a 1 to 1000 aqueous solution of azur I; 3 c.c. of a 0.8 to 1000 aqueous solution azur II. One drop of this solution added to 1 c.c. of water is used as the stain, the specimen being kept in the stain for 18 hours.

The Wassermann Reaction.—The *serum diagnosis of syphilis* depends upon certain principles. If the washed red corpuscles of the sheep (antigen) are added to heated serum of a rabbit, previously immunized with washed red corpuscles of the sheep (amboceptor), and fresh guinea-pig serum (complement) thus forming the "hemolytic series," hemolysis occurs. Bordet and Gengou showed that when emulsions of bacteria are mixed with inactivated serum and complement, hemolysis does not take place by reason of the anchorage of complement to the bacteria which prevents union of the red cell and complement through the ambocepter. This phenomenon has been applied by Wassermann to the diagnosis of syphilis. As in the immunization of the rabbit, so in syphilis, amboceptors are formed. When the blood serum of the monkey, made inactive or immune by previous syphilitic infection, was added to human syphilitic serum, no hemolysis occurred, showing that the monkey serum must have contained antibodies.

Method.—To the syphilitic antigen (extract of syphilitic organs) are added (1) the complement (fresh guinea-pig serum), (2) the suspected serum heated, (3) the amboceptor (heat-inactivated rabbit's serum), (4) the washed red corpuscles of the sheep, and the mixture is subjected to the action of incubator temperature. No hemolysis occurs by reason of the complement having been absorbed in the hemolytic series, the antigen and the serum tested being homologous. Such reaction is called positive.

The Noguchi Modification.—Recently Noguchi has modified this reaction by using human instead of sheep corpuscles in the hemolytic series. He has also introduced test papers saturated with antigen, complement and amboceptor. His method is as follows: An antigen paper is applied to a definite quantity of the suspected human serum and fresh guinea-pig serum is added. After being subjected to incubator temperature, it receives the addition of the hemolytic amboceptor paper and a definite quantity of washed human blood corpuscles.

Chancre (Initial Lesion, or Sclerosis).—A chancre is a modification of the sound or pathologically altered skin or mucous membrane occurring after syphilitic infection, and displayed after an incubation period, characterized by a circumscribed sclerosis and accompanied by an enlargement and induration of neighboring glands. The sole constant characteristics are: (1) An incubation period preceding its appearance—averaging between 10 and 30 days, ordinarily between 21 and 26 days, called the period of first incubation; (2) a sclerosis of the base of the lesion; (3) primary adenopathy, an enlargement and induration of the glands in nearest anatomic relation to the chancre. Every such initial lesion means a syphilis, mild or severe, actually present. Chancres may be represented at one time or another by every recognized lesion of the cutaneous surface, including the superficial erosion, the oftenest ignored and yet the commonest of chancre symptoms; the papule, the common result of inoculation of the skin as distinguished from that of the mucous surface; an ulcer, the result of local irritation, which may be shallow or deep. Mixed chancre exhibits at the outset all the features of the chancroid, but later becomes specifically indurated at the base, and is followed by a general syphilis. Another mixed variety is the chancre of syphilitic origin later infected with microorganisms. Persons infected with syphilis have usually but one attack in a lifetime, and most, if not all, of the so-called chancres of the syphilitic are without question gummatous. The initial lesion may occur upon any portion of the body surface, the genital region being most often involved merely because of the frequency of transmission during the sexual act. Extragenital chancres are not a rare occurrence. The lesions are seldom multiple; most often they are single, differing from the soft chancre, which spreads from one point to another on account of the autoinoculability of its discharge.

The induration of the initial lesion is one of its constant features. This may precede or follow the evolution of the chancre, or it may first be observed at the moment of detection of the sore itself; but sooner or later it wholly disappears. From the number or appearance of the lesions no prognosis can be made as to the severity or mildness of the ensuing disease. Chancres may or may not persist until the evolution of the systemic disease. They seldom leave scars, on account of their indisposition to undergo ulceration.

Diagnosis.—*The chancroid* is usually a pustular lesion, is never indurated, is usually multiple; the adenopathy is usually represented by a single bubo; and the secretion is indefinitely autoinoculable.

Herpes progenitalis lasts but a few days, is essentially vesicular, and the cause may often be determined without great difficulty in systemic derangement.

Balanitis is always short-lived, and yields readily to treatment; produces itching and burning; there is no induration or glandular complication and no ulceration.

Venereal warts are never indurated, rarely ulcerate, survive for long periods of time, and show no adenopathy.

Epithelioma occurs commonly after middle life, is of long duration, inactive, and noninflammatory.

Molluscum epitheliale is never ulcerated, indurated, inflammatory, or the seat of evidence of any acute process; and cheesy masses can be expressed from the orifice of the sebaceous gland involved.

Lichen planus presents lesions always papular, never indurated or ulcerated, or accompanied by glandular enlargement; and it is usually multiple.

Treatment.—Strict observance of cleanliness, in order to avoid any irritation of the sore, must be observed. Cleansing with warm water and hot borated solutions, followed by bland dusting-powder and the avoidance of salves and unguents, are the principal points to be observed. Mercury should be administered by the mouth when the diagnosis is satisfactorily established, but not before. The adenopathy ordinarily requires no treatment, unless painful, when frequent ablution with hot water is the best and most grateful method of treatment, followed, when needed, by a weak mercurial salve well rubbed into the overlying skin.

Division of constitutional syphilis into primary, secondary, and tertiary stages is now abandoned or largely modified, there being ordinarily no such definite demarcation in its manifestations. The majority of syphilitic histories may be traced within the four following divisions:

1. Benignant syphilis with mild and transitory symptoms. In these cases a slight efflorescence upon the abdominal surface, a few days of malaise, and the disease is at an end, irrespective of any treatment whatever. This is rare.

2. Benignant syphilis with relapsing or persistent superficial symptoms. This occurs in a large number of all cases occurring in the white race. Typical chancres are followed by superficial lesions without the production of any permanent results of the process. Patients of this large class, as a rule, entirely fail to exhibit symptoms of the type described as "tertiary."

3. Malignant syphilis with relapsing or persistent profound symptoms. The malignancy of these cases is declared in the deterioration of the tone of the system, in the production of cachexia, in the production of gummata, which resolve under appropriate treatment; or, when degeneration occurs, the repair is either good, or the damage resulting is so slight as not to interfere with bodily health. In this class the best results of treatment are exhibited.

4. Malignant syphilis with relapsing or profound lesions that are ultimately destructive. Here the disintegrating and ulcerating gumma destroys whatever tissue is attacked, and at times pushes its destructive forces to a fatal result. Syphilis, however, often mutilates, but rarely kills. In the majority of malignant cases the rapidity of progress of the malady is conspicuous.

The determining influences that result in these divergences are of the highest importance: First, a soil rendered favorable by other diseases or by malnutrition; second, neglect of early and proper treatment. The implantation of the germ of syphilis upon a system contaminated with tuberculosis, struma, and such cognate disorders as rickets is much rarer than is generally supposed.

The Evolution of Syphilis Subsequent to the Chancre.—The signs of a gradual intoxication are progressively apparent. The skin assumes a peculiar hue; there are often rheumatic pains, headache, backache, lassitude, neuralgia, and in some cases jaundice. The number of the red blood-corpuscles decreases and the leukocytes increase. Thermal variation may be absent or may be either slight or pronounced. Fever is more often observed in the cachectic and weak than in the strong. The lymphatic system exhibits characteristic changes; the glands become enlarged, soft, and voluminous, as distinguished from the densely indurated buboes accompanying the chancre. At a given moment this may be the sole appreciable symptom. They are usually painless and have no tendency to degenerate. Resolution is by the ordinary absorptive process. Syphilitic cachexia may occur either early or late, may be produced solely by the disease, and may be relieved greatly by properly directed medication, and may also be induced or aggravated by the injudicious employment of mercury.

Syphilis of the Skin.—A study of the syphiloderms is a study of the changes impressed by the infective process upon the simple manifestations of all skin-diseases. The early cutaneous symptoms are usually symmetric, but as the disease progresses, they exhibit a greater tendency to assymmetry. Although the terms "copper-colored" and "raw-ham tint" have been employed to designate the special hues of the syphilitic exanthem, there is displayed no color which may not at times be recognized in nonsyphilitic subjects; but the color with the other picture presented is usually highly suggestive. Multiformity is a characteristic of syphilis shared by but few other maladies. The arrangement of the syphiloderms in groups having the outline of a circle, either complete or in segments, is also highly distinctive. Itching and pain are ordinarily absent, but in some lesions, particularly in condylomata, the itching may be severe. Situation modifies the expression of the local manifestations. Pustules are often seen upon the scalp and on the face; papules, over the neck and brow; secreting lesions, around the mucus-outlets of the body. Papules are usually ham-colored, and have a tendency to scale at the apex. Tubercles are generally grouped, and tend to ulcerate and to crust. The crusts are usually bulky. Scales are commonly thin, and of a dirty whitish hue. Ulcers have a soft base, undermined edges, and a sloughing floor with purulent or hemorrhagic secretion. Pustular lesions are usually, if not always, due to secondary infection with pyogenic microbes. Scars, when recent, are generally pigmented; but when old, are of a dead white shade, with flaky, wrinkling surface.

Classification of the Syphiloderms.—

1. Macular. ....
    - (*a*) Pigmentary.
    - (*b*) Erythematous.
    - (*c*) Purpuric.
2. Papular..
    - dry. . .
        - (*a*) Miliary.
        - (*b*) Lenticular.
    - moist..
        - (*a*) Mucous patches.
        - (*b*) Condylomata.
3. Pustular.........
    - (*a*) Miliary.
    - (*b*) Lenticular.
4. Tubercular.
5. Gummatous.

1. **Macular Syphiloderms.**—The pigmentary variety occurs as a distinct network of macules, the pigment being gradually diminished, commencing in the center of each deposit, until at last it is wholly removed. This condition is most common in the earlier stages of the malady, and frequently in the uncleanly and negligent. The normal quantity of coloring-matter may remain after involution, or a true vitiliginous atrophy of the pigment may follow. The erythematous syphiloderm is the most common, the most benign, the earliest, and the most classic of the skin symptoms of the disease. It may be limited to the regions covered by the clothing, and it is for the most part unaccompanied by any subjective sensation. It usually appears between the sixth and seventh week, and is of a dull shade of yellowish-red, fading under pressure. As a rule, the eruption fades under treatment in a week or 10 days. The circinate arrangement may be conspicuous. Purpuric lesions are most commonly seen in the inherited form of the disease, though they are not rare in adults. It must be remembered that iodid of potassium is capable of producing purpura of the skin. When due directly to the disease, and not to the drug, it is a somewhat grave symptom.

2. **Papules.**—Papules are among the most common of the syphiloderms. They vary largely, according to the site of each lesion. Upon the exposed surface of the skin they are usually dry and squamous; upon apposed surfaces they enlarge, flatten, and secrete; upon mucous surfaces they form a mucous patch. Dry papules may be miliary, or from pinhead-sized to bean-sized or larger. When resolution occurs, the papule flattens to the level of the skin, leaving a pigmented macule, which is apt to be exceedingly rebellious to treatment and slow to disappear. When developing upon the palms and the soles, papules have a characteristic aspect and career, and will not readily be confounded with other disorders. The papule in this situation produces a cirumscribed thickening of the skin, which scales in the epidermal portions, and in extreme cases induces an ulceration in the region of each papular thickening. Papules sometimes linger for years as almost the sole symptom of the disease. The moist papule upon the mucous membrane becomes the **mucous patch**, which is pathologically identical with the moist papule of the skin. Moist papules occur on the skin in regions where the conditions are similar to those of mucous membranes with respect to heat, moisture, and the apposition of surfaces. On the mucous membranes they are moist, secrete a thin mucous, are offensive, and their secretion is highly contagious. Occasionally they develop into large vegetating masses; at other times they ulcerate. Condylomata are hyperplastic, moist papules, and are either flat or pointed. The flat condyloma is seen only in syphilitic subjects, and is a distinct symptom of the disease. Condylomata are found most frequently about the anus, and are usually the seat of a tormenting pruritus. The pointed wart is seen not only in syphilis, but in other venereal diseases as well. Condylomata are often compared in appearance to a cockscomb.

3. **Pustular Syphiloderm.**—Under this title are included all fluid-containing lesions of the skin—vesicles, pustules, and bullæ. When they appear, some accident has intervened to divert the career of the papule into singular channels—such as medicaments, pus microbes, neglect, filth, or parasites. They are extremely rare in properly treated patients. The lesions may be miliary, pinhead-sized to bean-sized, or confluent. They have frequently been mistaken for the lesions of smallpox, which they greatly resemble. The cicatrices left from the smaller lesions are rarely conspicuous; but from the larger and confluent sores the scars may be indelible. In the confluent variety there is distinct circular grouping of the pustules, and an ulcerating ring forms. There may be but few such lesions forming a single group. When repair ensues, the crusts fall, the ulcers granulate, and cicatrization concludes the history.

From *varicella* and *variola* this manifestation of the disease may be distinguished by the fever, by the activity of the lesion, by the umbilication and multiplicity of the sores; from *acne*, by the region invaded, the latter being usually limited to the face and upper trunk.

4. **Tubercular Syphiloderm.**—The tubercle is with difficulty distinguished from a gumma; clinically and pathologically there is little difference between the two lesions. Tubercles, ordinarily more superficial, are more apt to resolve, develop at an earlier period, are more numerous, and are more commonly grouped. Tubercles ordinarily occur after a lapse of from 2 to 10 years. They are firm nodules, copper-tinted, ordinarily arranged in portions of circles. They may be dry or atrophic, resolving beneath an unbroken epidermis, leaving a pigmented macule that fades and leaves an indented scar. They may be ulcerative, the upper portion of the small tumor being destroyed, involving either the small circumscribed area or producing broad, palm-sized, and larger destruction of tissue.

5. **Gummatous Syphiloderm.**—Gummata of the skin are at first uncolored elevations; later they become livid, as the integument becomes thinned to a point where bursting of the contents occurs through its envelope. They are usually late lesions, occurring from 2 to 5 years after the chancre, but may develop within a few months. They are most common on the leg; also common on the shoulders and back. The bones of the part invaded frequently suffer, causing extensive mutilation, especially about the face. Not the least conspicuous among the distinctive features of these severe ravages of syphilis is the extraordinary extent to which, when properly treated, repair ensues—a distinction of the highest value in respect to diagnosis.

Serpiginous and vegetating syphiloderms are conditions due to peculiar forms assumed by lesions previously mentioned, and are not special cutaneous expressions of the disease.

Syphilitic Affections of the Hair.—Syphilitic alopecia may be due to the action of the disease either upon the nutrition of the hair or directly upon the scalp. The most common form, however, produces no structural change in the integument. The loss of hair may be partial or general, affecting at times only the hair of the scalp; at other times, that of the entire body. As a rule, bare patches in areas from fingernail-size to palm-size occur upon the scalp. The lack of symmetry is noticeable; the hairs of one eyebrow for example disappearing while the other eyebrow remains intact. When the integument undergoes structural changes, the hair follicle itself is frequently destroyed, preventing a return of the hair; whereas in the simpler form already mentioned, the loss is not without remedy.

Syphilitic Affections of the Nail.—Syphilitic onychia and paronychia are not infrequent, and may coexist. There may be superficial exfoliations, fissures, or ulcers; the nail fold, the nail groove, or the matrix may be the seat of deep and ill-defined infiltration. The course is commonly indolent; at times, exceedingly painful. The odor is highly offensive and the secretions are contagious. The nail may be lost entirely or partially, and the new-formed nail may be correspondingly misshapen. This complication is often a portent of a grave syphilis, and is likely to occur in middle-aged patients with weakened constitutions. When the change is confined to the nail itself, there may be either atrophy, and a characteristic worm-eaten appearance, or hypertrophy with perceptible thickening.

Syphilis of the Mouth and the Tongue.—These lesions correspond strictly to those already studied as of occurrence in the skin, modified simply by peculiarities of site and by such habits as using tobacco, holding pipes, cigars, and toothpicks in the mouth, and by the drinking of hot or highly spiced liquids and the use of salted foods. Carious teeth pressing upon the tongue and cheeks are also frequently productive of such lesions. The macular syphiloderm produces an area of vivid or dusky redness, which may result in erosion or ulceration, but which disappears under proper treatment. The papular syphiloderm is here represented by the **mucous patch** of varying size, slightly raised above the general level. These patches are usually painful, and are succeeded by superficial erosion and ulceration, particularly at the angles of adjacent surfaces, such as the outer angles of the lips, where both the mucous and cutaneous surfaces may be involved. Gummata occur in the tongue, usually single, breaking down rapidly into ragged ulcers. Usually, these lesions are present in persons who are large users of tobacco, especially in chewers. In severe cases the results may be equaled only by the extensive ravages of cancer in the same region, but the repair wrought by skillful treatment is extraordinarily happy in results.

Syphilis of the Nasal Passages.—In this tract chancres are rare. The lesions present are mucous patches and gummata. The destruction is often extensive, the hard and soft palates being perforated or destroyed or passages being obliterated by cicatricial occlusion. The disease may thus extend to the meninges of the brain. Mucous patches and gummata also occur in the pharynx, producing grave destructive results when the bone is invaded. In the larynx typically developed mucous patches are rarely seen, but erosions and superficial ulcers may be discovered over the epiglottis, the vocal cords, and other parts on laryngoscopic examination. Later, gummatous changes may produce more serious accidents. The resulting ulcers leave cicatrices which may prove harmless or may draw together the walls of the larynx or fasten the epiglottis to the tongue or to the pharyngeal wall. The chief symptoms recognized without laryngoscopic examination are the hoarse voice, cough, dyspnea, and symptoms due to imperfect aeration of the blood, varying from the mildest to the severest distress. In the great majority of cases the prognosis is favorable, restoration of the voice being secured even after well-nigh complete aphonia for months or years. In the trachea and bronchi syphilitic lesions resemble those upon the structures immediately above. The more deeply syphilitic lesions spread toward the lungs, however, the greater is the gravity.

Syphilis of the Bones.—Most of the changes in bone are due to gummatous deposits, either in the periosteum, between it and the osseous tissue, within the bone substance, or in the medulla. The lesions are commonly multiple, forming tumors varying greatly in size, which are exceedingly painful, especially at night. In fact, the nocturnal exacerbations are considered diagnostic, and are due to the warmth engendered by the bedclothing, which increases the tension between the tense periosteum and the unyielding mass of the osseous tissue. The course may be either complete involution or degeneration by softening, the tumor breaking at the center, leaving an ulcer with exposed bone at the base.

Syphilis of the Joints.—Synovitis and arthritis may involve one or more joints. The articulations are tender, painful, and hot, motion is limited, and there are generally pyrexial symptoms. Termination may be by resolution, by ankylosis, or by destruction of the joints. The knee and the sternoclavicular and scapuloclavicular joints are chiefly involved.

The tendons and tendinous sheaths may be involved in gummatous processes; the aponeuroses may also be involved. In the muscles gummatous infiltration may involve the muscle bundles, producing pain, sometimes permanent contracture, or atrophy; the latter condition may also result from involvement of the nerves supplying the muscle. Syphilitic pericarditis is rare. Gummata have been found postmortem in the septa and substance of the heart. Fibrous myocarditis of syphilis is due to invasion of the coronary arteries. Aneurysm of the heart has been recognized as directly due to syphilis, and also to the indirect results of its cachexia. The blood-vessels may be affected by a fatty metamorphosis, resulting in the formation of aneurysmal pouches; or the endothelium of the vessels may be thickened, producing an endarteritis obliterans. Gummatous periarteritis has also been observed in both the circumscribed and diffuse forms.

Considerable difficulty in discriminating between gumma and tubercle of the lungs has obscured the characteristic features of syphilitic disease. The latter, however, is found in the posterior and lower lobes of the lung oftener than in its apex; and on section the lung closely resembles the condition seen in simple pneumonia, its substance being firm and grayish or reddish. The absence of leukocytes is conspicuous. The absence of tubercle bacilli is, of course, of the greatest value in establishing a diagnosis.

Syphilis of the intestinal canal is rarely encountered save in the anorectal pouch, where gummatous deposits are found. Gummata are sometimes found in the liver of the subjects of syphilis, near the capsule or deeply set. The effect is frequently like that occurring in cirrhosis. It is rare that symptoms pointing unmistakably to hepatic involvement are displayed during life. Syphilis of the spleen and pancreas is exceedingly rare. When these organs are involved, gummatous deposits of varying size are found.

In the anal region chancres are often mistaken for piles. The early lesions are usually flat papules, in consequence of heat and moisture becoming condylomata and mucous patches, which are rapidly developed. Syphilitic ulcers of this region are circular in outline, and have undermined walls and pultaceous floors, contrasting with the sharply cut, irregularly outlined walls and deep floors of tuberculous invasion.

Syphilitic stricture of the rectum, whether resulting from a proctitis leading to the specific complication, or from gummatous changes in the lower segment of the rectum, is more common in women than in men, and constitutes one of the most formidable of the complications of the disease. The lumen of the gut is interfered with in various grades, from those due to bands, bridles, or constricting rings around the organ to the severe grades in which the rectum is converted into a tortuous channel, interrupted by knobs and bridles and almost completely occluded. Relief is difficult in the absence of surgical interference, which may require division of the strictured portions of the gut by the aid of the electrocautery (often eventually valueless), by the production of an artificial anus in the groin, or by complete excision of the entire neoplasm. By the use of bougies relief may be secured for a time, internal treatment proper to the malady being at the same time instituted.

Gummata of the rectum may be single, multiple, or diffuse, occurring frequently in an annular form, producing the large majority of all rectal strictures.

Syphilis of the Genitourinary Organs.—Gummata developing in the corpora cavernosa are represented by nodules or, very rarely, by annular bands. Deep deposits in the urethra, as well as in the prostate gland and seminal vesicles, are quite rare. The epididymis and cord are occasionally invaded. The globus major and, more rarely, the globus minor become indurated, inelastic, and at times somewhat tender. Syphilitic orchitis is a frequent complication of late syphilis, the change occurring frequently without the knowledge of the patient. The gummatous infiltration may be circumscribed or diffuse, or there may be dense induration, suggesting the firmness of a marble. The size of the glands may be unaltered, or they may be either enlarged or shriveled. In other cases degeneration and bursting of the gumma result. Gummatous lesions of the vulva are not uncommon, while the vagina is rarely invaded. The cervix and os uteri may be the seat of either primary or consecutive lesions, which must be carefully differentiated from epitheliomata, polypi, and chancroids. The bladder is rarely involved. An acute nephritis due to syphilis may occur within a few months after infection, but recovery usually follows vigorous treatment. In late lesions lardaceous degeneration is characteristic. When both organs are involved, the prognosis is grave; but good recovery ensues frequently when but one organ is affected.

Syphilis of the Nervous System.—Changes in the nervous system due to syphilis may result from the effects of the disease upon the osseous system, upon the meningeal coverings of the nerves, upon the nerve-cells and fibers, or upon the vessels furnishing nutriment to the nerves. A fatal issue in syphilis can more often be ascribed to the nervous than to any other system. Gummatous deposit in the cortical portion of the brain is perhaps the most common involvement. An obliterating endarteritis may cause thrombosis and subsequent occlusion, or small aneurysms with subsequent rupture and cerebral hemorrhage. The symptoms are headache, with nocturnal exacerbation, possibly aggravated by pressure over certain points. The capriciousness and multiformity of the surface symptoms, however, are striking. Monoplegic or hemiplegic attacks indicate affection of the larger ganglia. Lesions of the crus, of the pons, and of the medulla are indicated by symptoms similar to those produced by other lesions of the same areas. Syphilis of the cord may produce bilateral spastic paralysis of the lower extremities, exaggeration of tendon-reflexes, contractures of muscles, rectum and bladder symptoms, and, in some cases, severe pains in the lower limbs. Syphilis is, without question, a precedent fact in a large majority of all cases of tabes and paralytic dementia.

Syphilis of the Eye.—Any of the ocular appendages—the eyelids, the lacrimal gland, the canaliculi, the sac, and the nasal duct—may be involved in any one of the early or late manifestations of syphilis. Syphilitic iritis is the most common of all luetic affections of the eye. The subjective symptoms are photophobia, lacrimation, deep-seated pain, and imperfect vision. There are noticed change of color, irregularity of the pupillary opening, sluggishness of the iris, and deep ciliary injection. The prognosis is good. Syphilitic choroiditis is next in frequency. The symptoms are clouding of the vitreous humor by specks on the membranes, diminution of ocular tension, pain, and amaurosis. Pure retinitis without choroiditis is rare. The fundus is misty, the papillå is obscured, and the disc is encircled by a grayish retina. Exudation and hemorrhages may occur. The optic nerve may be affected either within or without the cranial cavity. Bilateral choked disc indicates an intracranial lesion. When but one eye is involved, the disturbance may be wholly within the orbit. Atrophy of the optic nerve may result. Syphilis of the ocular muscles is due not to a specific myositis, but to intracranial lesion. Implication of the bony walls of the orbit, causing pressure upon the nerve, may produce exophthalmos and violent neuralgia. Abscesses may form and burst, leaving fistulous tracts to carious bone.

Syphilis of the Ear.—The external ear may be the seat of any of the cutaneous lesions of systemic syphilis. The membrana tympani is rarely attacked. Most syphilitic affections of the middle ear result directly from disorders of the nasal pharynx and eustachian tube.

Hereditary Syphilis.—Syphilis may be transmitted from progenitor to offspring as a strictly inherited disease. **Colles' law** points conclusively to the fact that syphilis of the child means syphilis of the mother, whether or not the mother betrays other symptoms of the disease. It cannot always be determined whether such women have been infected with syphilis directly, from their husbands, or indirectly, from the syphilitic contents of the uterus. If, however, the mother is without syphilis, the child commonly escapes. The period of pregnancy beyond which the mother cannot transmit her disease to her unborn child is not fixed. After the sixth month the child probably escapes. The question whether inherited syphilis can be transmitted to the third generation can, for the immense majority of all cases, be answered in the negative. The question respecting acquisition of syphilis later in life by the subject of inherited disease is to be answered in the same manner. A few cases have undoubtedly occurred in which the victim was not certainly protected from a second attack.

Syphilis of the Placenta.—In some cases of undoubted syphilis of the offspring the placenta has been found wholly free from morbid symptoms, while in other cases the villi are represented by gummatous masses, and the vessels of the cord have been more or less obliterated. It is a matter of importance to note that the liquor amnii of the woman bearing a syphilitic fetus is capable of communicating the disease to the accoucheur.

Symptoms of Hereditary Syphilis.—A series of pregnancies resulting in abortions, first at an earlier and later at a more advanced stage of gestation; these succeeded by one or more miscarriages, and the latter by the birth of a mature child surviving but a few hours, furnishes a typical history of syphilis of the mother. Eventually, a child may be born apparently healthy at birth, but before the fourth month may develop symptoms of inherited disease. The mortality in these cases is between 60 and 90 percent. About seven-eighths of diseased infants exhibit symptoms of the inherited malady before the termination of of the third month. Children showing symptoms of the disease at or about the age of puberty have, in all probability, really betrayed evidences of syphilis in infancy that were overlooked.

The cutaneous lesions in a fetus aborted as the result of syphilis are maceration of the skin and bullæ filled with ill-conditioned serum. A viable child may be born with a specific exanthem more or less generally evolved. An infant under the average weight, weazened, yellow-tinted, snuffling, with an aged appearance, with blisters on the fingers and toes, a circlet of papules about the mouth or anus, with a feeble cry and obvious weakness, enables the practitioner to make a diagnosis at a glance. In these infants the syphiloderm may be macular, papular, or tuberculous. The nails, hair, glands, bones, and genital organs may be affected. The saber-blade deformity of the tibia is characteristic. The teeth, as described by Hutchinson, are characteristically notched, particularly the central upper incisors. (See TEETH IN DIAGNOSIS.) The pharynx, larynx, trachea, and bronchi may be the seat of changes that may destroy the perichondrium or cartilages. The liver may be the seat of miliary or of larger sized and diffused gummata. The spleen is frequently enlarged. The kidneys may present evidences of lardaceous degeneration. The nervous system may suffer in any portion, resulting in mental states varying from feeble-mindedness to complete idiocy. With the exception of retinitis and optic neuritis, the eye and ear are subject to most of the disorders of the acquired disease.

Treatment of Syphilis.—Attention to the general health far outweighs in importance the question of drugs. An ample supply of nutritious and digestible food; alcoholic beverages in wise discretion, according to the judgment of the practitioner; daily sponging with salt water—cold, if the patient is vigorous—with rubbing with coarse towels afterward, are important aids to a favorable issue. The use of tobacco invites mucous patches in the mouth, as does any other irritation, such as the use of chewing-gum, constantly holding toothpicks in the mouth, and the presence of carious teeth. Diversion of the mind, outdoor living, care of weak eyes, of hernia, or of hemorrhoids, all have distinct value. Delay in instituting systemic treatment until the fullest recognition of the disease has been established in no way jeopardizes the future of the patient or his amenability to the later management of his malady. In fact, an early and frank efflorescence is an augury for good in an otherwise healthy subject. The length of time during which treatment should be kept up varies according to the health before infection, the management during treatment, the virulence of the infection, and the surroundings of the patient. Most patients practically recover after from 2 1/2 to 3 years.

Mercury holds the most important place among drugs esteemed efficient both for the relief of the symptoms and for the radical cure of the disease. Its preparations, in the order of their value, are the protiodid, the bichlorid, the biniodid, the tannate, blue pill, calomel, and the gray powder. It is well to begin with an average dose of the metallic salt, to be increased according to indications. The patient should gain in weight, and should digest his food with appetite and profit. The protiodid may be given in doses of from 1/10 to 1/3 grain after each meal, combined with Vallet's mass or the citrate of iron and quinin. Whenever such a course seems desirable, any one of the other preparations of the metal may be substituted for the protiodid; for instance, the bichlorid 1/60 to 1/12 grain; the biniodid, 1/50 to 1/16 of a grain; the tannate, 1/2 to 1 grain; bluepill, 1/4 to 1 grain; calomel, 1/10 to 1/4 grain; and the gray powder, from 1 to 5 grains. It is believed that, when all progresses satisfactorily, the patient who secures complete immunity from symptoms of his disease in the first half year does better when no remedy is administered save mercury. Other things being equal, he who has secured complete relief from syphilis without using the iodid of potassium has usually had either a mild or an exceedingly tractable form of the disease.

Iron is administered with decided advantage to the great majority of all patients affected with syphilis, and should be used whenever not contraindicated. The iron and quinin citrate, from 3 to 8 grains before meals, or the muriated tincture of iron in combination with corrosive sublimate (of the latter, 1/60 to 1/30 grain after meals), may be used.

Inunction of mercury has the excellent recommendation of sparing the stomach, and is also of advantage in grave cases or in cases of emergency; also when there are persistent lesions refusing to yield to internal medication. The ointment, in 50 percent strength, combined with lanolin or vaselin, should be rubbed in until it has practically disappeared. Often it is desirable to give a course of 20 inunctions, after which the rubbing may be suspended while other treatment is pursued, the inunctions being renewed until the entire number advised is completed. New areas of inunction should be selected on successive days in order to avoid dermatitis. Such a dermatitis is, however, rarely serious. When it really seems to demand treatment, a simple dusting-powder or Lassar's paste usually suffices.

The mercurial vapor bath is both efficient and speedy, and in an emergency is capable of producing very rapid effects. Calomel or cinnabar, or the two in combination, may be selected. It is best given before bedtime, and should last for about half an hour. If debility is induced by the steaming, tonics, and even a generous glass of wine with the dinner, should be administered.

Hypodermic injections are employed more frequently than formerly. Rapidity of effect, the sparing of the digestive tract, simplicity, and cleanliness are contrasted with its danger, its liability to produce abscesses at the site of injection, cardiac and pulmonary symptoms after injection within a vein, considerable pain, exhaustion, and possible sudden death. If, nevertheless, the hypodermic treatment is selected, strict surgical cleanliness and asepsis are extremely important. Corrosive sublimate is usually employed, dissolved in a few minims of water suspended in olive oil or emulsified, and in the strength of from 1/12 to 1/10 grain. The method has not as yet shown results that warrant its adoption as a routine treatment, its disadvantages rendering its general adoption improbable. The well-known toxic effects of mercury—including salivation, dyspepsia, anemia, and symptoms simulating those of muscular rheumatism—must be carefully watched, for many symptoms popularly accredited to mercury are really due to the syphilis, and are wrongly imputed to the metal.

Intramuscular injections have come into prominence in the last few years, the gluteal region being the preferable site. Of the soluble salts, the benzoate and the binodid of mercury are most frequently used; of the insoluble the salicylate, calomel and gray oil.

Intravenous injections of soluble salts have proved valuable in the hands of some clinicians. See INTRAVENOUS INJECTION.

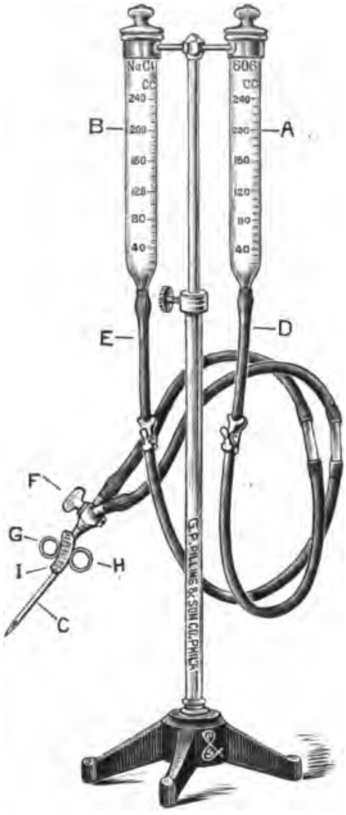
Arsenic has recently been advocated, alone or alternately with mercury. Of the three forms which have recently come into favor atoxyl, soamin, and arsacetin (*q. v.*), the first has been found to produce optic atrophy. The second, soamin, too has been reported to be dangerous. Arsacetin, the most stable and least toxic is probably the preferable drug. See ARYLARSONATES.

Salvarsan ("606").—The latest addition to specific therapy is Ehrlich's synthetic arsenic compound, arsenobenzol (dioxydiamidoarsenobenzol dihydrochlorid) called "606," as it was the 606th preparation tried. A single injection of a proper dose is reported to be as destructive to the spirochæta pallida as quinin is to the plasmodium malariæ. Within a day or two one injection of the drug will kill all the spirochetes in superficial lesions such as mucous patches or primary lesions.

The dose of "606" at present is from 0.45 to 0.6 gram injected subcutaneously below the scapula. "606" is an unstable yellow powder put up in vacuum tubes to prevent its rapid oxidization in the air. In order to make the injection painless—the acid solution resulting from the addition of water producing much pain—the drug is injected in the form of an alkaline salt (Alt) or, preferably, of a neutral base (Wechselmann's method) The neutral base is obtained by dissolving the dose to be given in 1 to 2 c.c. of sodium hydrate solution and then adding acetic acid, drop by drop. To the fine yellow precipitate—the base—that forms is added 1 to 2 c.c. sterile distilled water and then 1/10 normal sodium hydrate or 1 percent acetic acid, as required, until the reaction is exactly neutral to litmus. Ehrlich warns against the use of the drug in advanced disease of the heart or blood-vessels or in ocular disease involving the optic nerve. Attempts are being made to reduce to a minimum the toxicity of the drug. The latest improvement—Ehrlich's "hyperideal" is claimed to be but one-third as toxic as the original. While there is not complete unanimity on the byeffects of the drug, all the clinicians who have been testing it agree that it is not toxic to the human adult in doses of five to eight grains, and that it is a remarkable specific for syphilis.

Intravenous injection is now being used; it is claimed that this method is painless, more powerful in its effects upon the *Spirochæta pallida*, allows of more accurate dosage, and is not followed by so many bad after-effects.

Boehm's method of giving salvarsan intravenously is described by Hirsch as follows: "Two graduated glass containers of 250 c.c. capacity are used. Into one is poured 150 to 200 c.c. of sterile salvarsan solution. The other is filled with a like volume of sterile saline solution (made with sterile distilled water and chemically pure sodium chlorid). The saline solution is allowed to flow out of the needle so as to expel all air from the tube. The stop-cock is now reversed, allowing the salvarsan solution to flow out of the needle, thereby expelling all air from its tubing. The stop-cock is now reversed to its former position, until the saline solution is running in a slow even stream from the needle. The desired site of puncture is selected on the arm or at the elbow, and the needle is gently pushed or thrust through the skin into the vein. Meanwhile the saline solution is continuously running from it. The needle is held at about an angle of 10 to 15 degrees to the skin surface, depending on the prominence and caliber of the vein. Care must be exercised not to push the needle through both walls of the vein. This can be avoided by not introducing too long a surface of the needle into the tissues.



The patient's arm having been carefully cleansed, a ligature in the form of an ordinary soft rubber catheter or tubing is tied around the middle of the arm, above the selected site of puncture, and the patient is requested to tighten the fist so as to make the superficial veins more prominent. Some prefer to expose the vein in all cases.

As soon as the needle has entered the vein, the rubber ligature is released by an assistant, the stop-cock of the needle is reversed, and the salvarsan solution flows through the needle into the vein. Hence there is no danger of any salvarsan solution getting into the subcutaneous tissues. The intravenous injection must be given slowly, not less than ten minutes being spent in the process; and the solution must be quite warm when poured into the container so as to allow for its cooling when flowing into the apparatus; when it enters the vein, the solution should be about the temperature of the blood. An ideal intravenous injection is painless."

Iodin and its compounds stand next after mercury in value. The following are conditions in which it is wise to employ them: First, in attempts to resolve gummatous lesions; second, when the patient is intolerant of mercury, or when he cannot be made to gain in weight and appetite during youth; third, when the patient is being subjected to the action of mercury by external use; fourth, as an alternate medication to mercury. Iodin is the one remedy earliest and most often resorted to by the ignorant, and it is the one which is last used, and then most effectively, by the expert. The dosage depends almost wholly on the emergency presented. Ordinarily, it may be administered in 5-, 10-, or 20-grain doses; but as high as 600 grains, and even more, of the iodid of potassium have been given in 24 hours with favorable results. It should be stopped or reduced upon the occurrence of any symptoms of iodism, constipation, or bladder trouble, or as soon as the immediate effect in view is secured. As a rule, the toxic effects of the drug speedily disappear when the exhibition of the remedy is suspended.

"**Mixed Treatment.**"—This term designates a method by which mercury and a salt of iodin are administered at the same time in a single dose. A 6-ounce mixture containing from 1 to 3 grains of the biniodid and from 1/2 to 2 ounces of the potassium iodid may be advantageously given in teaspoonful doses after meals. One of the bitter tinctures may be added to produce a tonic effect. The corrosive sublimate may be substituted in equal amount for the biniodid.

The treatment of syphilitic lesions as they are presented in the several organs of the body:

Syphilis of the skin yields to systematic treatment, but at times local treatment is of value. The erythematous and papular syphiloderms may be sponged with warm boric solution and anointed with an unguent having vaselin or cold cream for a basis, with from 5 to 20 grains of calomel or white precipitate to the ounce; or the following may be used:

℞.	Mercuric chlorid,	gr. iv
	Alcohol, Tincture of benzoin, Tincture of tolu, Glycerin,	each, ʒ j
	Rose-water, enough to make	℥ iv.

For the papular and scaling lesions nothing is better than mercurial ointment in full or reduced strength. Condylomata should be washed with deodorizing solutions of chlorinated soda or boric acid, after which they are to be dusted with equal parts of calomel and starch or with boric acid. Pustular lesions, especially over the face, require careful attention. Washing with hot boric solution, followed by touching with a solution of corrosive sublimate, 1 or 2 grains to the ounce of benzoin, should be followed by dusting with calomel, europhen, or boric acid.

Early syphilitic alopecia should be treated by shampooing with tincture of green soap 3 or 4 times a week, followed by an unguent of white precipitate or calomel, 5 grains to the ounce of vaselin, or 1 dram of precipitated sulphur and 1 grain of cinnabar to the ounce.

Mucous patches should be touched daily with a silver nitrate solution, or with the solid stick. This should be done by the physician. For individual use, a lotion or gargle may be employed, such as 1 dram of potassium chlorate and 1/2 ounce each of honey and tincture of myrrh to 6 ounces of distilled water, diluted as required. When the palate is involved, medication should be prompt, both internal and local, and should be pushed to the largest tolerated doses.

In cases of **ozena** a vapor from the following solution should be snuffed through the nostrils:

℞.	Phenol,	ʒ j
	Tincture of iodin,	ʒ iv
	Ammonia water,	ʒ ij
	Cologne water,	ʒ iv.

Pharyngeal lesions may be treated with medicated sprays, caustics, the galvanocautery, or the knife.

The nails, when involved, should be bathed in warm borated water, followed by a weak mercurial salve or dusting-powder.

Syphilis of the bones and periosteum calls, in general, for the iodid of potassium internally, with mercurial unguents or plaster over accessible nodes or tumors. Any sequestrum should be removed when completely separated.

In all cases of **visceral syphilis** there is urgent need of systematic tonics, together with antisyphilitic treatment.

Lesions of the rectum and anus call for the iodids in large doses.

Strictures should be dilated by rubber bougies; and when the result of such treatment is only temporary, surgical interference is indicated.

When the epididymis or body of the **testicle** is involved, the iodid internally and abstention from sexual intercourse usually give good results.

Lesions of the nervous system require the largest tolerated doses of the iodids, with inunctions of mercury at the same time. Tonics, a highly nutritious diet, and daily sponging with hot water are valuable.

For treatment of the **eye and ear,** the reader is referred to the special articles on diseases of these organs. See EAR (Diseases), IRITIS, RETINITIS, etc.

The special treatment of the **syphilitic pregnant woman** is by mercurial inunctions, together with the mixed treatment. When the syphilitic infant is at the breast, the treatment of the mother is not to be neglected. Only upon very strong evidence should direct treatment of a syphilitic infant be begun, since even after the birth of intensely syphilitic fetuses and a series of abortions there are brought into the world children who never exhibit signs of the disease even when both parents have been infected. The child should always be nourished by its mother, and should never be allowed to take the breast of a healthy wet-nurse. When symptoms are unmistakably present, the child may be given calomel, 1/20 to 1/2 grain 3 times a day, together with tonics; or the protoiodid in doses of 1/10 to 1/4 grain; or corrosive sublimate, $\frac{1}{100}$ to $\frac{1}{50}$ grain. Iodid of potassium may be given cautiously, from 1/4 to 5 grains. Mercurial inunctions may be used in the earliest period of life. The ointment should be combined with 2 or more parts of pure white vaselin, and increasing quantities should be used until 20 to 30 grains are rubbed in daily.

The acquired syphilis of infancy is chiefly remarkable for its display of moist and secreting lesions and for its failure to relapse in cycles when the disease is duly recognized and properly cared for. But in unrecognized or neglected acquired syphilis of infancy the results may be as mutilating and as disfiguring as in the worst phases of acquired disease of later years.

SYRINGOMYELIA.—The morbid condition caused by the presence of an adventitious cavity in the spinal cord or by dilatation of the central canal.

Pathologic Anatomy.—The cavities are formed partly by defective closure of the central spinal canal and partly by the breaking down of the residual embryonal tissue. The cavity of a syringomyelia is usually in the posterior part of the cord, extending toward the posterior cornua. It may prevail throughout the entire extent of the cord, but in most cases involves only the cervical or dorsal regions or more limited areas.

The essential symptoms are loss of sensibility, chiefly to pain and to temperature; and, to a less degree, loss of simple tactile sense; also muscular atrophy, the latter progressive in development. The sensory symptoms are the earlier and the more constant. There may not only be a loss of thermal sense, but it may be reversed, in that heat is felt as cold, and vice versa. So, also, subjective sensations are felt, including heat and cold, or in their absence pain, which may be neuralgic in character. The involvement of all forms of sensibility probably takes place when the postero-internal columns are extensively involved. The muscular atrophy is the result of injury to the motor cells of the anterior cornua in the compression to which they are subjected in the dilatation. There is also muscular weakness, involving the trunk muscles, from which lateral curvature sometimes results.

The reflexes may or may not be increased, and myotatic irritability may in rare cases be lost, while tremor of the limbs has been noted in some cases. Trophic symptoms are not rare in the parts affected by sensory loss. The skin may be glossy and thin, or thick and horny, while there may be eczema, herpes, bullæ, even ulceration and gangrene. The nails may become fissured and drop off. Vasomotor disturbances are more common, including coldness, lividity, or redness with swelling and heat. There may be sweating, or its absence, brittleeness of bone, and joint changes like those of tabes.

The area of the cranial nerves may be invaded when there is involvement of the medulla and pons. The phenomena include paralysis of one vocal cord and of the tongue and face, difficulty in swallowing and in breathing, and embarrassed heart action. The eyes may be disordered; the pupils unequal, and smaller on the side where greatest severity of symptoms exists, but the other special senses escape, and the sphincters are unaffected.

Diagnosis.—This is based upon the sensory symptoms, and of these, thermoanesthesia and analgesia, rather than tactile sensibility, together with muscular atrophy succeeding after some interval. Cervical pachymeningitis runs a more rapid course; the anesthesia includes all varieties of sensation, and corresponds more nearly in its distribution to that of the muscular atrophy; pain is more conspicuous, and the reaction of degeneration is commonly present in the wasting muscles. The symptoms of syringomyelia are sometimes simulated by the anesthesia and wasting of anesthetic leprosy; but in the latter disease the trophic changes are more marked, the phalanges often drop off, while the sensory symptoms include all varieties of sensation.

Progressive muscular atrophy differs in the absence of altered sensation. A spinal tumor in the same situation as a sytingomyelia furnishes almost identical symptoms, and may have an identical origin if it starts from the neuroglia; but the symptoms are more rapid in their development (Tyson).

Prognosis.—This is ultimately fatal, although the course is slow, extending over a period of from 15 to 20 years. Toward the end the course is more rapid, death resulting from exhaustion or from interference with the functions of the medulla.

Treatment.—This consists of measures to combat such symptoms as cystitis, bed-sores, etc., and general tonic and alterative measures.

SYRINGOMYELOCELE.—See SPINA BIFIDA.

SYRUPS.—Concentrated solutions of sugar in water or in aqueous liquids. They sometimes contain acetic acid, and occasionally alcohol; and are termed *simple*, *medicated*, or *flavored*, according as they are simple solutions of sugar in water alone, or contain soluble medicinal substances or flavoring ingredients. The sugar used should be very dry, and its official description corresponds with the granulated sugar of commerce. The permanence of these preparations depends chiefly on their possessing the proper relative proportions of sugar nd water. They are prepared either by solutiona with heat, by agitation without heat, by adding a medicated liquid to simple syrup, by digestion or maceration, or by cold percolation. They are best preserved by being poured while hot into pint bottles, which should be corked securely while full, and the tops dipped into melted sealing-wax. Fermented syrups are useless for dispensing purposes. There are 29 official syrups.

T

TABACUM.—See Tobacco.

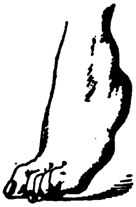
TABES DORSALIS.—See Locomotor Ataxia.

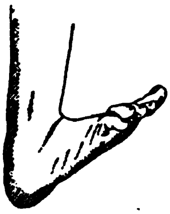
TABES MESENTERICA (Tuberculosis of the Peritoneum.)—See Peritonitis; Scrofula; Tuberculosis.

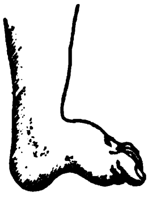
TACHYCARDIA.—Abnormal paroxysmal or persistent rapidity of cardiac action. The pulse may attain a speed of 200 a minute. It is a comparatively rare affection, due to paralysis of the inhibitory nerve of the heart or to stimulation of the cardiac accelerator nerves. See Heart-disease (Functional). See Heart Examination, Pulse.

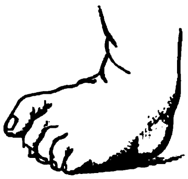
TAKA-DIASTASE.—See Diastase.

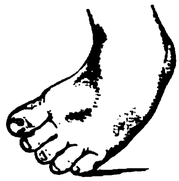
TALIPES (Club-foot).—Talipes is the technical name for club-foot, whether congenital or acquired. Congenital talipes presents varieties not so numerous and less complicated than the acquired form, which develops after the second year of life. The features of congenital talipes are so pronounced that one can differentiate this from the acquired form. Acquired talipes is easily recognized, and is marked by a loss of power in certain groups of muscles, although it must be admitted that a moderate grade of talipes, resulting from slight paralysis in early life, may assume the characteristics of a congenital form in later life. Such cases, however, are exceptional. The different varieties, then, are: (1) Talipes equinus; (2) talipes varus; (3) talipes calcaneus; (4) talipes valgus; (5) talipes cavus; (6) talipes planus.

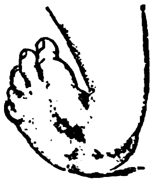

Talipes Equinus.


Talipes Calcaneus.


Talipes Cavus or Arcuatus.


Talipes Varus.

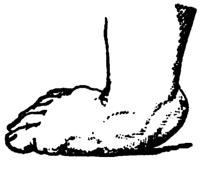

Talipes Equinovarus.

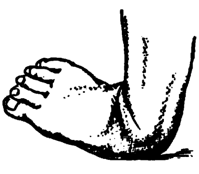

Talipes Calcaneo varus.

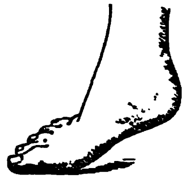
1. **Talipes equinus** may be described as extension of the foot, with spasm or shortening of the tendo Achillis, and usually with a loss of power in the anterior tibial group. The patient stands on the tips of the toes, on the distal ends of the metatarsals with the toes hyperextended, on the ball of the foot with the heel slightly raised or on the heel and ball of the foot, but is unable to dorsiflex the foot beyond a right angle. It will thus be seen that there are four grades of equinus. Equinus is more frequently combined with varus, but it may be associated with valgus and cavus. Congenitally, it is more frequently associated with varus, and, as an acquired deformity, with valgus. It is also associated with cavus. The terms, then, would be talipes equinovarus, talipes equinovalgus, talipes equinocavus.

2. **Talipes varus** is an inversion of the foot, associated with rotation at the midtarsal joint. The degree of the deformity is determined by the amount of manual correction possible and there are recognized: first, easily corrected and maintained; second, corrected and maintained with difficulty; and third, incorrigible by the hands. Anatomically, the tissues on the inner side of the ankle and foot are shortened, and certain tendons, such as the anterior tibial and the flexor brevis pollicis, are displaced toward the inner and posterior aspect of the limb, while the structures on the outer side are lengthened and the tendons likewise are more or less displaced. Bones, ligaments, muscles, and fascia all participate in these changes. Varus is associated with equinus, usually as a congenital deformity; less frequently as an acquired deformity. Occasionally it occurs with cavus; very seldom with calcaneus.

3. **Talipes calcaneus** is, as a rule, an acquired deformity; exceptionally, it is congenital. The deformity is characterized by elongation of the tendo Achillis and of the muscles associated therewith, by shortening of the anterior tibial group of muscles, and by slight flexion of the toes. The os calcis becomes very prominent, and the patient literally walks on the heel. This bone lies vertically in place of horizontally, in the severer forms and is continuous with the vertical axis of the leg. Calcaneus is associated with valgus, frequently with varus, and not infrequently with cavus.


Talipes Valgus.


Talipes Calcaneovalgus.


Talipes Equinovalgus.

4. **Valgus** is usually acquired, rarely congenital, and is a deformity of the foot in which eversion is a prominent feature. The outer border of the foot is raised, the foot is everted, the patient stands on the inner border of the foot, and, as in the other varieties of talipes, presents the different degrees. In an extreme form the patient would bear the weight on the internal malleolus. Valgus is the opposite of varus, and is combined with equinus and calcaneus: never with cavus.

5. **Cavus** is an exaggeration of the normal transverse arch of the foot, and is the result of bony subluxation at the midtarsal joint and of contraction of the plantar fascia. The typical cavus of third degree is seen in the foot of a Chinese lady.

6. **Planus** is the opposite of cavus and is a relaxation of the ligamentous, fascial and tendinous structures in the arch and sole of the foot. The arch sags and there is a flat-foot. It may be relaxed or rigid and is due to many different causes, among which are obesity, occupation, ill-fitting shoes, right-angled equinus, and weakened tissues in the foot.

Etiology of Talipes.—The appearance of talipes equinovarus, dependent upon slight paralysis many years previously and not influenced by treatment, is so much like the congenital deformity that the points of distinction are well-nigh obliterated; hence the popularity of the theory that a congenital club-foot results from an intrauterine paralysis. The theory advanced many years ago by Essericht, of Copenhagen, is that the feet of the fetus occupy various positions during the course of intrauterine life, in order that the joint surfaces, the muscles, and especially the ligaments may be developed in accordance with the future usefulness of the feet; that when anything centric or excentric prevents the feet from assuming these positions at the proper time, or holds them in any given position beyond the limit of time during which they should normally occupy such a position, talipes results. The variety of congenital talipes will depend upon the date of its production; the severity will be in direct ratio to the mechanic obstruction at work.

The etiology of acquired talipes is less difficult, the more common form being the result of anterior poliomyelitis, although it must not be inferred that talipes is the necessary result of the paralysis; it is, rather, an accidental result.

Of themselves, few cord-diseases produce talipes; but the resulting muscular contractions induce the deformity. The bilateral equinus in cases of compression myelitis is well known; yet the deformity rarely receives treatment. In cerebral hemorrhage in infancy the gastrocnemius is often the seat of a contraction that, by its long persistence, ends in contracture of the tendo Achillis.

Ostitis of the ankle occasionally includes an equinus, a varus, or an equinovarus. Rachitis may be mentioned as one of the causes, but in reality, when deformity occurs, it is believed to be due to weak ankle or "spurious valgus." Cicatrices from lacerated wounds of the ankle may be mentioned as another cause.

Spastic paralysis has for one of its manifestations an equinovarus or an equinus, usually first noticed when the child begins to walk. There also exists a marked inward rotation of the limbs, and the deformity is readily recognized, being bilateral, symmetric, and easy of correction by manual force.

Many of the milder forms of talipes can be attributed to sprains of the ankle. However slight the deformity, the pain and annoyance caused by use are often greater than when the deformity is more marked, and to this mild grade of the deformity Schaffer has given the name of "nondeforming club-foot." Rheumatism may be mentioned as an occasional cause of talipes valgus; indeed, it is not an uncommon cause of what is known as spasmodic pes planus.

The symptoms and signs of talipes and of its varieties may be gathered from the foregoing, and little need be said beyond the description already given. There are really very few symptoms that belong to talipes. The signs are those of deformity, and are noted either as the patient stands or walks. Occasionally, in very young children, when the deformity is congenital, standing and walking are not necessary to bring out the signs.

Diagnosis.—The recognition of the various forms of talipes is easy, and particularly is this so of the deformity in the second and third degrees. It is only in the first degree that confusion may sometimes arise. Many infants in arms present certain evanescent deformities of the feet that are regarded as club-foot. A child, for instance, when it begins to stand, bears the weight on the toes and balls of the feet a good deal; the heels are raised, and deformity apparently exists. In especially stout children, in whom the gastrocnemius is flaccid, and in whom the tendo Achillis is easily stretched, a calcaneus can be produced, and often is produced. When the tendo Achillis is distinctly short, or when the anterior tibials are short and there is a history of paralysis, a talipes equinus or a talipes calcaneus may easily be diagnosed. Deformity must also be differentiated from weak ankles—a very common condition in rachitic subjects or in children who are very stout.

Prognosis.—Talipes is a deformity that can easily be corrected at almost any stage; in a young child the prognosis is exceedingly difficult. It may be said that under efficient treatment, long continued, the prognosis is good: that is, a useful foot—one free from deformity—with functions fully restored.

Treatment.—The treatment of talipes is both mechanic and operative. The two must not be regarded as separate and distinct, but as supplementing each other. The most efficient treatment is a combination of the two.

Mechanic.—The particulars underlying mechanic treatment are, first, an appliance that will hold the heel and the front of the foot in position; and, second, a lever that will correct. This lever must extend up the calf or to the thigh; sometimes to the pelvis.

The principal types of club-foot shoe are:

1. **The Knight club-foot shoe,** which is a modification of the old Scarpa shoe. This consists of a

foot-plate the shape of the sole of the foot, made of metal—steel preferably—covered by leather; a heel-cup of steel, consisting of uprights passing from a point just below one malleolus to the other; and leather, thin saddle skirting, shaped to a model of a heel, riveted to these steel uprights. An instep strap is also required, and this may be continuous with the heel-cup. The upright consists of a spring of steel passing from the outer side of the heel-cup and terminating at a calf band that is secured in place by a leather band. Half of the band is of steel. Where the spring is attached at the ankle there is a stop-joint, which holds the foot at a right angle with the leg and allows dorsiflexion, but no extension. In many instances there are double uprights in place of single ones. In adjusting this club-foot shoe the foot-plate is first secured to the plate by means of the instep strap and a bandage around the toe; then the spring is pulled back so that the calf band will grasp the calf. In making use of it, one must change frequently—at least twice a day—manipulate the foot at the same time, and guard against excoriations.

2. **The Taylor club-foot shoe** is practically the same as the Knight shoe in principle, except that the spring is on the inner side of the leg, and in place of a small calf band there is a lacing attached to a plate that passes along the inner side of the leg.

3. **The Schaffer club-foot shoe** is intended for traction on the tendo Achillis and on the plantar fascia.

The operative procedures are: Division of tendons and fascia; subcutaneous division of ligaments, either subcutaneously or by open method; open section, after Phelps; removal of the head and neck of the astragalus; osteotomy through the neck of the astragalus; cuneiform osteotomy through the os calcis, practised by Bradford; removal of the astragalus, known as astragalectomy; and supramalleolar osteotomy. All these are cutting operations, but the one most frequently resorted to is correction by manual force, frequently supplemented by the Thomas wrench—practically a tarsoclasis.

The order of operation should be as follows: (1) Division of the tendo Achillis and plantar fascia, supplemented by manual force for overcorrection; (2) division of the tendons, supplemented by subcutaneous division of the deltoid ligament, and, in addition, manual force and the Thomas wrench; (3) the open division of all obstructing soft tissue on inner side of foot (Phelps); (4) removal of head and neck of astragalus; (5) cuneiform osteotomy (Davies-Colley); (6) supramalleolar osteotomy.

The details of these various operations are simple, and few instruments are required.

Tenotomy, fasciotomy, syndesmotomy, and myotomy are performed with a small tenotome not any longer than a fascia knife. The subcutaneous tenotomy is better than the open method, because the operation is simplified, and need never be followed by sepsis. There is no special instruction needed for the site of operation. The most prominent portion of tendon, fascia, ligament, and muscle invite, so to speak, the insertion of the tenotome either directly down upon it or underneath it.

For the **open method of Phelps** the usual preparations for an aseptic operation are necessary. The foot and leg are rendered as nearly bloodless as possible by an Esmarch bandage, and then an incision is made through the skin, beginning at a point about 1 inch anterior to the internal malleolus and extending across the inner margin of the sole rather obliquely for a distance of about 1 1/2 inches. While eversion is made with one hand the section is continued to greater depths, until all tissues that offer resistance are divided. With foot thus in overcorrection rubber tissue is stretched over the gaping wound, and a sterile dressing applied over this and around the foot and ankle. The plaster-of-Paris may be applied before or after removal of the Esmarch bandage. The hemorrhage is seldom an annoying feature, and the blood becomes organized, filling in the gap with new tissue.

The operations of **astragalotomy** and **astragalectomy** are made through an incision over the head of the astragalus, prolonged sufficiently to admit of removal of the head and neck after section with osteotome, or of the entire bone after section of the ligaments holding it in place. The wound is sewed up with or without drainage, as the operator may prefer.

The cuneiform osteotomy of Davies-Colley is made through an incision over the cuboid and fifth metatarsal on the dorsal aspect. The wedge includes usually the cuboid and a portion of the distal end of the os calcis or the proximal end of the metatarsal. The smaller portion of the wedge encroaches on the middle and external cuneiform bones and the astragalus.

The section of the tibia and fibula above the malleoli is made subcutaneously by an osteotome, and the point selected is about 2 inches above the malleoli. Manual force supplements the section, and the foot is put up in eversion.

All of these operative procedures are of little avail if the deformity is not overcorrected at once, and if the good position secured is not maintained by a dressing that does not yield. Plaster-of-Paris is to be preferred. One should not be content with a single plaster-of-Paris dressing, but should renew this once a fortnight, getting the foot into better position at every dressing.

After a few weeks in plaster the foot should be fitted with one of the club-foot shoes described and over this a shoe should be worn. The anatomy of the talipes foot must never be lost sight of, and the apparatus should be worn until normality is reestablished.

The mechanic treatment of flat-foot includes the construction of a boot or a shoe so that the inner border of the foot will be raised and the weight of the body thrown nearer to the normal vertical axis of the leg with the foot.

This may be accomplished in two ways: (1) By building the boot on a last with a high arch—known as a Spanish last—and inserting an insole the inner border of which shall be from 1/8 to 3/8 inch thicker than the outer border, especially at the heel and the ball of the shoe. (2) Fill in the shank with leather along the inner side the same height as the heel, and make the inner border of the sole and this elongated heel from 1/8 to 3/8 inch thicker than the outer border (Thomas). The effect of this is to remove the natural spring of the shank of the shoe and to throw the weight of the body over toward the middle and outer side of the foot. In the more severe forms of pes planus, associated with much bony deformity and spasm, correction of the deformity by manual force, under an anesthetic, and retention in plaster-of-Paris for two weeks will render the foot amenable to a steel shank worn within the shoe. The shank that gives most relief is known as the Whitman spring. The best fit is secured over an iron model taken from a cast of the foot in the corrected position.

Cutting operations involving removal of bone are seldom called for, in view of the relief afforded by the milder operative procedures.

In many cases it is advisable, and even necessary, to correct the deformity by manual force, under an anesthetic, and then allow the foot to remain in plaster-of-Paris some weeks before applying a sole-plate. The thorough and persistent use of exercise after the correction of the deformity is essential to the ultimate cure of the case and recovery may be aided by strapping with adhesive plaster to prevent external rotation of the os calcis and assist in supporting the arch.

When flat-foot is of congenital origin, it is sometimes necessary to refresh the astragalo-scaphoid articulation, and to nail the bones together in a corrected position. In general, however, the operative treatment of flat-foot is rarely necessary.

TAMPON.—Tampons are used principally for the purpose of applying pressure—as in uterine displacements and in vaginal and uterine hemorrhages—and for depleting in pelvic and uterine inflammatory conditions. When depletion is desired, the tampon should be made of fine lamb's wool saturated with glycerin, or 10 percent solution of ichthyol in glycerin. The well-known hygroscopic action of the glycerin acts most favorably in cases of chronic congestion from laceration of the cervix, subinvolution, and pelvic inflammation. Tampons used for this purpose are removed at the end of 24 hours, after which a hot vaginal douche is given. They may be introduced at intervals of from 2 to 5 days.

As a means of effecting continued pressure, tampons are occasionally useful in backward displacements of the uterus complicated by slight adhesions. Lamb's wool should here be used, and the tampon should be placed well back of the cervix in the posterior vaginal vault. It should be renewed daily.

For the purpose of controlling vaginal and uterine hemorrhages nothing is superior to the tampon. The tampon in these cases should be of iodoform or sterile gause. It is removed usually at the end of 48 hours.

TANNALBIN.—A light brown powder recommended as an excellent intestinal astringent in chronic and subacute intestinal catarrh. Dose for adults, 1/2 to 1 1/2 drams; for children, 5 to 15 grains. Tannalbin is a compound of tannin and albumin, and may be prepared as follows: To 10 parts of a 10 percent solution of albumin 6.5 parts of a 10 percent solution of tannin are added; the precipitate formed is collected on a strainer, washed, pressed, and dried at 30° C. The resulting mass is then triturated and forced through a fine sieve, and finally spread out in thin layers and dried for 6 hours at 120° C. This compound is only decomposed by the alkaline secretions of the intestines.

TANNIC ACID (Tannin).—Tannic acid is a glucosid obtained from many vegetable astringents. The official tannic acid of the U. S. P. and B. P. is made from galls, and is distinguished from that occurring in leaves, barks, etc., by the name of gallotannic acid, while the others take the name of the source from which they are derived, as quercitannic acid, from oak bark. Tannic acid is solid, uncrystallizable, white or slightly yellowish, inodorous, without bitterness, very soluble in water, less soluble in alcohol and ether, especially when anhydrous, insoluble in the fixed and votatile oils. It is also very soluble in glycerin, and almost insoluble in absolute ether, chloroform, benzol, and benzine. It is incompatible with alkaloids, gelatin, albumin, and solutions of tartrate of antimony and potassium, and with ferric salts, with which it forms a black precipitate (the old-fashioned ink). It does not react with the salts of the ferrous oxid. If it is rubbed with the chlorate of potassium, the mixture explodes with great violence; hence these drugs should never be ordered in powder together, and if they are prescribed in the same solution, they should be dissolved separately. From tannic acid is prepared styptic collodion (containing 20 percent of tannic acid in the diluted collodion), troches of tannic acid (containing each 1 grain of tannin), and the ointment of tannic acid (containing 10 percent). See QUERCUS.

The effect of tannic acid resembles more closely that of alum than that of any other mineral astringent. It is more irritating, however, than the agent last named. This effect can be reduced in a measure by combination with borax and a small proportion of phenol. A paste prepared by mixing tannic acid two-thirds and gallic acid one-third is thought by some practitioners to be superior as a hemostatic powder to one in which only tannic acid enters. It enters in combination with gun-cotton and ether, and in this form is known as styptic collodion.

A combination of the effects of tannic acid and carbolic acid is obtained as follows: to a half pint of water add 1 dram of tannic acid and 2 grains of phenol; filter throughly, with care. Glycerite of tannic acid is useful in the proportions of glycerin 5 parts and tannc acid 1 part. A tannated cotton is prepared by steeping absorbent cotton in a solution of tannic acid.

Tannic acid is of special value on mucous membranes and on abraded or superficially ulcerated skin surfaces. It is noted that many of its indications are found in localities where sound integument joins a mucous- or ichor-yielding lesion, as at the nostril, anus, or vulva, and at the margins of ulcers, fissures, etc.

TANNIGEN.—An acetic ester of tannic acid. Dose, 3 to 8 grains, up to 2 drams daily. A yellowish-gray powder used in chronic diarrhea as an intestinal astringent.

TANNISMUTH.—Bismuth bitannate. It is claimed to be efficient in chronic intestinal catarrh. Dose, 5 to 10 grains.

TANNOFORM.—A compound of tannic acid and formaldehyd. It is a powerful intestinal antiseptic and astringent. Dose, 4 to 8 grains. It is used locally in 10 percent ointment or dusting-powder with 2 to 4 parts of starch.

TANNOPIN (Tannon).—A condensation product of tannin with hexamethylenamin. It has the same action as its two components, into which it is gradually decomposed in the intestines. It is recommended in intestinal catarrh, in tuberculous enteritis, and other intestinal disorders. Dose, 15 grams.

TAPE-WORMS.—See Worms (Tape).

TAPOTEMENT.—See Massage.

TAR.—See Pitch.

TARAXACUM (Dandelion).—The root of *T. officinale.* Its properties are due to a bitter extractive principle; it is tonic, diuretic, and also aperient. It is of reputed use in dyspepsia. Dose, 1 to 8 drams. **T., Ext.** Dose, 5 to 30 grains. **T., Flext.** Dose, 1 to 8 drams.

TARTAR (Argol).—A hard mineral deposited on the inside of wine-casks as a whitish or reddish crystalline crust, the impure supertartrate of potassium. **Tartar** is also the name applied to a hard incrustation on the teeth, consisting of mineral and organic matter. **T., Cream of,** purified argol or acid potassium tartrate. **T., Emetic,** the tartrate of antimony and potassium. See Antimony.

TARTARIC ACID.—$H_2C_4H_4O_6$. A dibasic, organic acid, chiefly employed in refrigerant drinks and in baking-powders; 20 grains neutralize 27 of potassium bicarbonate, 22 of sodium bicarbonate, and 15 1/2 of ammonium carbonate. Dose, 5 to 20 grains. It is widely distributed in the vegetable world, and occurs principally in the juice of the grape, from which it deposits, after fermentation, in the form of acid potassium tartrate (argol). It results on oxidizing saccharic acid and milk-sugar with HNO_3. It crystallizes in large monoclinic prisms, which dissolve readily in water and in alcohol, but not in ether. It melts at 167°-170° F. Its salts are the **tartrates.** See Antimony, Potassium, Tartar.

TASTE, DISORDERS.—Taste is the sense by which savors are perceived and discriminated. The glossopharyngeal nerve and the lingual branch of the fifth pair are the nerves mainly connected with this sense, of which the tongue is the chief organ. The lips, the insides of the cheeks, the palate, and the pharynx also receive impressions from sapid substances.

The chief sensations of taste are called sweet, sour, salt, bitter, and metallic. Flavor usually blends with the gustatory sense, but it is due to the sensation of smell reaching the olfactory mucous membrane through the posterior nares. If the posterior nares are closed, so that no air passes up through them, the sense of flavor is lost and only that of taste remains. It is necessary, therefore, to distinguish between the senses of smell and taste, and, as well, to determine how far sensations that are in themselves normal are responsible for alternation of the appreciation of the sense of taste: *i. e.*, how far the sense of taste is increased or diminished in its enjoyment of or disgust at some article, the sensation itself being normal.

Taste may be impaired or lost from a variety of causes: (1) from morbid conditions of the mucous membrane of the tongue and palate, as in chronic gastritis or rhinitis; (2) from lesions of the nerves concerned in the conduction of sensory impression; (3) from certain cerebral conditions.

The first variety of causes is most common, and impairs, rather than destroys, the sense of taste. The parts of the mouth capable of receiving taste impressions are the tongue, the palate, and the palatine arches. A dry tongue or a thick coating dulls the sense of taste.

The fifth nerve is the one usually concerned in disorders of taste. It is more likely that this nerve is concerned in taste impressions of the posterior portions of the tongue and soft palate than the glossopharyngeal nerve.

In caries of the middle ear loss of taste for both the back and front of the tongue usually is noted. In general hemianesthesia and in hysteria loss of taste on one or both sides of the tongue and mouth is likely. Gustatory hyperesthesia occurs in myxedema and in mental and epileptic disorders, and is sometimes of central origin.

Tests.—Various substances may be placed on the protruded tongue, the eyes being closed. The quantity of the substance should be small, and taste should be perceived before the tongue is withdrawn into the mouth. The following are used: for bitter, quinin; for sweet, honey; for sour, vinegar; for salt, common table salt; and for metal, a feeble electric current.

Treatment.—This depends upon the etiology. Mercury or podophyllin as purgatives are to be used for a cankery taste unconnected with alcoholism, or half a glassful of pure, cold water may be taken half an hour before breakfast. Gray powder, 1/3 grain given 3 or 4 times daily, will usually remove from the mouth the disagreeable taste due to dypepsia, in chronic disease, or in early convalescence. Electricity may add to the function of taste when its loss or perversion is due to nerve-disease.

TATTOOING.—The operation of marking the skin permanently by the introduction of foreign substances, such as carbon, India ink, and vermilion. It is a common practice among sailors, the color being introduced into the true skin by pricking it with needles.

Tattooing as a therapeutic measure, to restore the natural colors in parts which are pigmented, is occasionally resorted to. For white, use baryta white; and for other colors, the earth colors (ochers —yellow, brown, red). To assist these, cinnabar and ultramarine may be used. Mix the colors on a glass plate and impregnate the needles. Electrolysis, followed by tattooing, is useful in cases of vascular nævi.

Tattooing of the cornea is an operation to diminish the unpleasant appearance of leukoma of the cornea by tattooing the same so as to simulate the appearance of the normal pupil and iris.

To Remove Tattoo Marks.—The method recommended by Variot is as follows:

The skin is first covered with a concentrated solution of tannin, and retattooed with this in the parts to be cleared. Then an ordinary nitrate of silver crayon is rubbed over these parts, which become black by formation of tannate of silver in the superficial layer of the derma. Tannin powder is sprinkled on the surface several times a day for some days, to dry it. A dark crust forms, which loses color in 3 or 4 days, and in 2 weeks or so comes away, leaving a reddish scar, free of tattoo marks, and, in a few months, is scarcely noticeable. It is well to do the work in patches about the size of a silver dollar at a time. The person can thus go on with his usual occupation.

TAXIS.—A reduction of a prolapsed structure, as a hernia or a prolapsed uterus, by methodic manipulation without instruments. See HERNIA.

TEA (Thea).—The leaves of *Camellia theifera*, a Chinese evergreen shrub. Tea contains an alkaloid (thein) and tannic acid, boheic acid, gallic acid, gluten, coloring-matter, etc. A decoction of the leaves is a popular astringent, restorative beverage, producing an exhilarating effect upon the nervous system. Used to excess, it powerfully affects the stability of the motor and vasomotor nerves, the action of the heart, and the digestive function, producing flatulent dyspepsia, tremulousness of the limbs, pallor of the surface, irregular cardiac action and feeble impulse, hallucinations, nightmare, anorexia, headache, nausea and vomiting, obstinate neuralgia, especially of the supraorbital and occipital nerves; also constipation and a pain in the left side are not infrequent. The condition of chronic tea-poisoning is termed *theinism or theism*, and is very often seen among women of the lower class in cities, who do not indulge in alcoholic beverages, but freely accept the dominion of the "cup that cheers" and worse than inebriates. Tea contains much more tannin than coffee, and that used as a beverage by the poorer classes is little more than a decoction of tannin, and a fruitful source of dyspepsia and other forms of gastric disorder. The properties of tea are due to thein, $C_8H_{10}N_4O_2$, a substance identical with caffein and a mild cerebral stimulant.

TEETH, ACHING.—See TOOTHACHE.

TEETH, EXTRACTION.—When extracting any tooth carry the beaks of the instrument employed up under the free margin of the gums and alveolar process until you can close the forceps upon the middle third of the tooth, thus reducing in a large measure the possibility of breaking the crown off and leaving the root. The above accident frequently results when one endeavors to extract by only grasping the tooth at its neck.

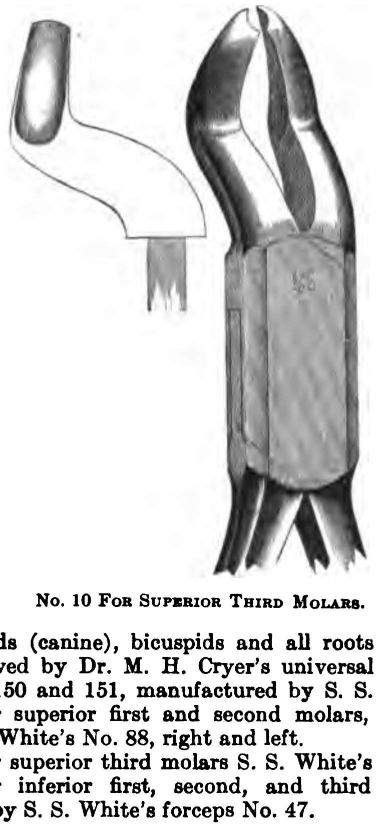
Position of Operator and Patient for the Extraction of Teeth.—Have the patient seated in a solid chair, and his head tipped slightly back, on about a level with the operator's chest, who now takes his position on the right side, and passes left arm around the patient's head and places his fingers between the lips in such a position as will best expose the teeth to be extracted and protect those not to be removed.

This position is maintained when removing all the superior and inferior teeth from right lateral to left third molar with but slight shifting of palm and fingers to best support the face or mandible, and protect the lips from injury. Some operators will find it advisable to lower the patient and have his head carried slightly forward when extracting these inferior teeth.

Take position to right and facing patient when removing all superior and inferior teeth from right cuspid to third molar. Protect lips and sustain face and body of mandible with palm and fingers of left hand.

Order of Eruption of Permanent Teeth.—See DENTITION.

Forceps to be Employed in the Extraction of the Permanent Teeth.—Upper and lower incisors, cuspids (canine), bicuspids and all roots can be removed by Dr. M. H. Cryer's universal forceps No. 150 and 151, manufactured by S. S. W. Co.



No. 10 FOR SUPERIOR THIRD MOLARS.

For superior first and second molars, employ S. S. White's No. 88, right and left.

For superior third molars S. S. White's No. 10.

For inferior first, second, and third molars employ S. S. White's forceps No. 47.

Detailed Description of the Application of the Forces to be Employed in the Extraction of all Permanent Teeth. *Superior incisors.*—First a slight rotary motion, and then carry the tooth bodily in a labial direction with slight traction.

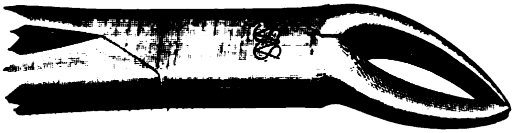
Superior cuspids (canines).—Carry the tooth in a labiolingual motion with positive careful traction.

Superior first bicuspids.—Apply force cautiously in buccolingual direction, and positively no rotary motion employed for fear of fracture of the frail root ends.

No. 151 Cryer's Universal Lower Incisor, Cuspid, Bicuspid, and Root Forceps.

Superior second bicuspid.—A slight buccal and rotary motion with gradual traction.

Superior first and second molars.—Positive downward and slight buccal movement until the lingual root is gradually loosened, then careful traction without rotation.

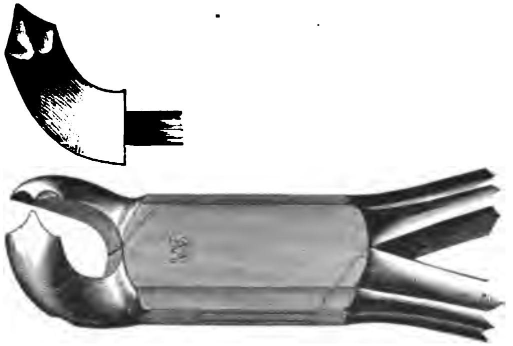


No. 150 Cryer's Universal Upper Incisor, Cuspid, Bicuspid, and Root Forceps.

Superior third molars are easily extracted by the creation of traction buccally.

Inferior incisors are removed by the application of labio-lingual motion. Great danger of root fracture with application of slightest rotary force.

Inferior cuspids.—First a labiolingual force then a gradual rotary traction.

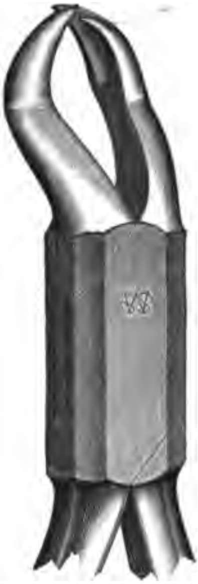


No. 47 For Inferior first, second and third molars.

Inferior first and second bicuspids.—A buccolingual force, then slight rotary motion.

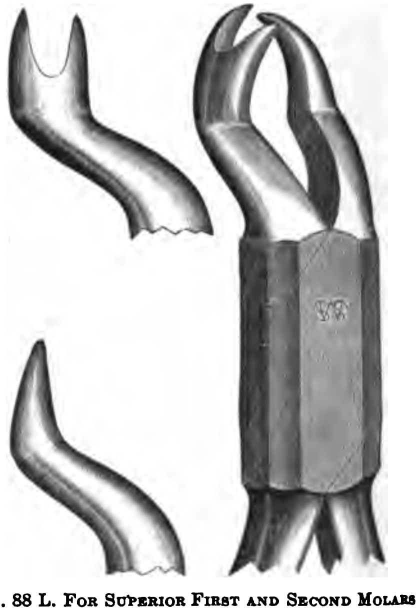
Inferior first and second molars.—A buccolingual and traction force without any rotary motion.

Inferior third molars.—The most difficult one of the molars to extract; and the direction of the force to be applied should be slightly toward the cheek with positive traction that is directed a little backward.



88 R. For Superior First and Second Molars.

To properly grasp some partially erupted inferior third molars, the bony alveolar process and soft tissues on buccal and lingual sides must be cut away before the beaks of the forceps can be properly placed.



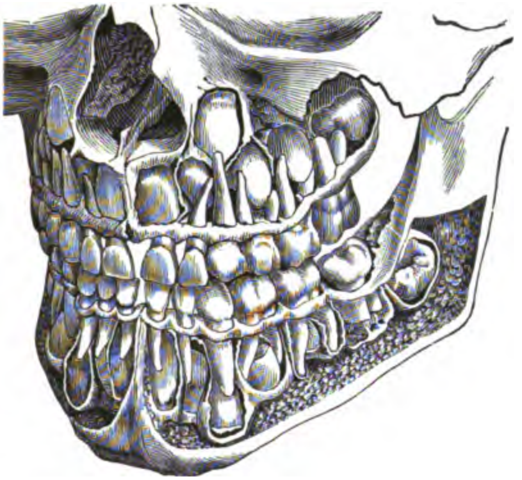
No. 88 L. For Superior First and Second Molars.

Order of Eruption of Deciduous Teeth.—See Dentition.

Deciduous teeth should be retained their full term, for the known beneficial influence their presence has upon the normal development of the jaws and face.

When extracting the deciduous teeth, take same position as outlined as appropriate for the extraction of the permanent ones. Forceps No. 250 and 251 as designed by M. H. Cryer will be the only ones needed for the removal of all the deciduous teeth.

Great care should be exercised when extracting deciduous teeth that the beaks of the forceps are not carried to a depth that might engage the oncoming teeth.



Illustrates the Jaws of a Child between six and seven years of age, showing the relations of the two sets of teeth.—(*Harris.*)

Treatment of Post-operative Hemorrhage Following the Extraction of Teeth.—To determine what socket is the seat of hemorrhage where a number of teeth have been extracted at one time, have the patient rinse out his mouth with a sterile solution, then immediately applying a previously prepared solid roll of cotton, about the size of the index finger over a number of the openings from which the teeth have been extracted, holding said pack under pressure from one to three minutes. Then remove and the deepest blood stain will be found above the socket where the excessive hemorrhage has been occurring. By this procedure you have the location and number of openings needing interference.

For controlling this hemorrhage, employ a pellet of cotton that will comfortably fill the opening to be packed. Saturate this with alcohol and then thoroughly incorporate it with powdered tannic acid (tannic acid causes the most insoluble clot to form in the presence of saliva).

Now with curved dressing forceps force the medicated cotton pellet to the bottom of the socket and hold it in position until it has become well saturated with blood, and ceases to have a tendency to leave its position.

Remove the pack in 24 to 48 hours and do not replace unless for the purpose of controlling a secondary hemorrhage.

In some pronounced cases the extracted tooth after proper sterilization has been replaced to control the hemorrhage. One precaution that should always be observed is that an operator should never dismiss a patient after the extraction of a tooth until all pulsating hemorrhage has ceased.

A Few Brief Statements in Reference to the General Question of Extraction of Teeth.—The use of an elevator for the extraction of any lower tooth should be condemned on the grounds that in their employment the mandible may be, and frequently has been, fractured.

Care must be exercised in maintaining a positive grasp upon the extracted tooth until it is well out of the mouth, to prevent its slipping from the forceps into the patient's throat.

When teeth are to be extracted from both arches, remove lower ones first, thus maintaining this field more free from blood.

Cocain above a 1 percent solution should not be employed as a local anesthetic for the extraction of teeth.

Injections should not be made into an abscess area, but may be made about it.

Chloroform is the most dangerous general anesthetic that can be administered for the extraction of teeth, and nitrous oxid should always have the preference; when prolonged anesthesia is demanded and continous nitrous oxid anesthesia cannot be maintained, ether should be employed *and not chloroform.*

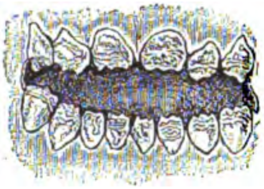
The superior and inferior second deciduous molars and cuspids (canines) should never be extracted before the child has reached the age when the permanent ones will soon be erupting, otherwise a positive irregularity of the permanent teeth will result.

No permanent or deciduous tooth should be extracted if it can be made comfortable and useful.

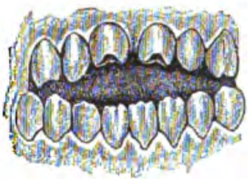
Teeth may be extracted during any stage of the formation of a dental alveolar abscess without danger to the patient.

Never extract a patient's tooth without first informing him that you are about to do so; otherwise you betray your patient's confidence.

TEETH IN DIAGNOSIS.—In hereditary syphilis the permanent teeth, especially the upper incisors, are notched in a most peculiar manner. The cutting-edge, instead of being straight, with 2 or 3 small serrations, is concave from side to side; the whole tooth is dwarfed, and, especially at the sides, is somewhat beveled off from above downward, so that it has a peg-shaped



Mercurial Teeth.
(*Hutchinson.*)



Syphilitic Teeth.
(*Hutchinson.*)

appearance. This change, which was first described by Hutchinson, is characteristic; it very rarely, if ever, occurs under any other circumstances, and it is caused by, and is proportionate to, the stomatitis of infancy. If this is severe at the time the dental papillæ are developing, they are so much reduced in size and so altered in shape that it is almost impossible to recognize them as teeth. Mercurial teeth and malformed teeth after certain infantile exanthems, in which the enamel is defective transversely and is marked by horizontal darkened grooves and pits, are totally different, but it is not uncommon to find the two associated. In exceptional cases in which the stomatitis has been late or prolonged, a similar change is visible in the lateral ones as well; but it is only the median teeth of the upper jaw that are definite and characteristic.

TEETHING.—See DENTITION.

TEMPERAMENT.—A term vaguely applied to the predominance of one group or order of constitutional functions over others in an individual. The various divisions of temperament were based on the former doctrine of the four humors of the body—blood, lymph, bile, and atrabilious or black bile, the predominance of any one resulting respectively in a sanguine, lymphatic, bilious, or melancholic temperament. Although the doctrine of the temperaments has long since lost its significance, it is generally admitted that an individual may have a predisposition to types of mental action not improperly classed as nervous, phlegmatic, lymphatic, etc.

Bilious temperament is that marked by a predominance of bile, persons of this type having sallow complexions, dark hair, sluggish circulations. They have great firmness and endurance.

Lymphatic temperament is that characterized by fair complexion, light hair, flabby muscles, slight force of character, and slightly developed passions.

Nervous temperament is that characterized by great activity and sensitiveness of the nervous system.

Sanguineous temperament is that characterized by fair or ruddy complexion, rapid pulse, a hopeful disposition, and strong passions.

TEMPERATURE.—Observations on the temperature of the body are valuable for diagnosis, because the temperature is easily altered when normal action of the nervous system is disturbed or in consequence of disease, or when toxic or infectious substances have been introduced into the body from without; because changes in the blood temperature occur to herald the onset of disease before even its presence is discernible or before even the slightest indisposition is present; because the courses of many diseases are accompanied by corresponding alterations of temperature, and because, in the numeric expression of the variations, and the complex conditions of disease, the thermometer will detect earlier and judge more correctly the conditions of the patient's body than any other means.

The temperature in health in the mouth of an adult is about 98.4° F. In the vagina and rectum it is 0.3° F. to 0.6° F. higher. In health there may be a difference of 20° F. between the temperature of exposed parts of the skin and the interior. Throughout the day the temperature varies. It is lowest between 2 and 6 A. M., gradually rising until its highest points are reached between 5 and 8 P. M. This rise is usually slower in the middle of the day, the afternoon hours showing a more rapid elevation. These facts are of fundamental importance, since they affect the judgment of health and disease. Race and sex have no influence upon the range of temperature. Age does influence the range of daily temperature. In an infant just born the temperature is slightly higher. In the first weeks of life a higher temperature is maintained. The temperature is very easily influenced in children. In old age also the temperature is higher than in adult life, and a greater mobility of temperature is observed. Pregnancy has no appreciable influence on temperature, although parturition increases the temperature slightly. As a rule, the constancy of the bodily temperature in health is such that general conditions of life, occupation, etc., show but little influence over it.

Local changes in temperature are brought about by local influences or by disease of a part. In a paralyzed limb the temperature may be lower or higher than in the other limb. In hemiplegia the paralyzed side is frequently higher in temperature. Neuralgia sometimes gives an increased temperature in the part affected, and hysteria is liable to show a variety of temperature changes.

In taking a temperature it is necessary:

1. That no local influence, such as unusual exposure or the passage of cold air or of hot or cold fluids, shall affect the temperature of the part selected.
2. That the bulb of the thermometer should be in most complete contact with surrounding parts, the column of mercury not being exposed.
3. That ample time should be allowed for the mercury throughout the tube to attain an even temperature.
4. That the thermometer should be read with the eye vertically over the point of the index.
5. That the observation be cautiously repeated if the result is unexpected, and with a reliable instrument. See THERMOMETER.

Depression of temperature is observed in hemorrhage, starvation, wasting from chronic diseases, and diseases of the brain and spinal cord. In brain-disease, with the symptoms of melancholia, lowering of the general temperature and extreme coldness of the surface occur. In the collapse of typhoid fever, in acute peritonitis, and in poisoning by various substances, temperature is lowered. In cholera the axillary temperature may be 89.6° F., while the general temperature may reach 104° F. In alcoholic intoxication general temperature may be greatly lowered, particularly when the patient has been exposed to cold and wet. In chronic diseases of the respiratory tract, in chronic heart- or kidney-disease, and in chronic nephritis the temperature is somewhat lowered.

Elevation of Temperature.—External cold after fatigue by exercise, in addition to the cooling of the body from respiration, may be followed by a rigor, with rapid rise of temperature. No disease developing, the proper balance will soon be restored. The temperature may rise from such disturbance of the heat-regulating functions as the passage of a gall-stone or of a stone through the urethra. An injury may derange the nervous system and its heat regulation, causing the temperature to rise. Temperatures of from 110° to 111° F. have been observed after injuries to the spinal cord (cervical portion). In tetanus temperature as high as 112.5° F. has been observed. In sunstroke or heat-stroke a similar point has been reached. There is sometimes a rise of temperature just previous to death.

Hyperpyrexia has followed convalescence from acute rheumatism; and excessive rise in temperature has caused death in hysteria, although a high temperature to which the pulse and respiration do not correspond is suspicious.

In convalescence trifling external influences may cause a rise in temperature.

Significance of Abnormal Temperatures.—

Temperature is below normal at 97° F. (36.2° C.).

Subnormal temperature is 97°–98° F. (36.2°–36.7° C.).

Normal temperature is 98.0°–99.5° F. (36.7°–37.5° C.).

Temperatures Above Normal.—*Subfebrile*, 99.5°–100.5° F. (37.5°–38.5° C.). *Moderate febrile*, 100.5°–102° F. (38.05°–38.88° C.), for the morning; 102.2°–103° F. (39°–39.44° C.), for the evening. *Febrile temperature of high degree*, 102.5° F. (39.2° C.) and more in the morning; 105°–106° F. (40.6°–41.1° C.) in the evening. *Hyperpyrexia*, 105.8°–107.5° F. (41°–42° C.).

A temperature below 93° F. (33.88° C.) or above 108° F. (42.22° C.) is almost always fatal. As a single observation this is of value, and in a general way such observations are of value for diagnosis. When other symptoms exist, the knowledge of an altered temperature will alter the aspect of the case. Fatigue, and its effect on temperature, should, of course, be eliminated in a single observation of temperature. Systematic series of observations are of greater value. In types of pyrexia this method will indicate the mode of rising, whereby some disease may be distinguished. Thus, in pneumonia the temperature rises rapidly and continuously to about 104° F. (40° C.); in typhoid fever a gradual rise in each succeeding day of about 2° F. occurs, going down again each morning about 1° F., the maximum of about 105° F. being attained on the fifth day. At the height of a disease the temperature fluctuates about 103° F. (39.5° C.), the range varying in different diseases.

Considerable remissions or intermissions may be observed in the decline of acute diseases, while in certain other chronic affections—such as syphilitic affections, tuberculous affections, in pernicious anemia or leukemia—the remissions become more marked as exhaustion of the patient increases. The intermittent type of pyrexia is shown in malarial diseases, chronic tubercular disease of the lungs, and pyemia.

Crisis in the decline of a fever occurs when the temperature falls rapidly to or below the normal in from 12 to 26 hours, even in 6 to 8 hours. Lysis is the gradual decline of elevated temperature by a daily fluctuation. The former may be accompanied by collapse or acute delirium, neither of which is of unfavorable prognosis, and from which conditions patients rally well. Irregularity in temperature in a disease which usually runs a definite course indicates some complication. External causes easily influence temperature in convalescence. See CHILL, COLD, FEVER, HEAT-STROKE.

TENDERNESS.—The condition of abnormal sensitiveness to touch; soreness. It usually implies pain in varying degrees and of different kinds, elicited by pressure or by percussion, as distinguished from subjective sensation felt spontaneously by the patient. It is a symptom of great importance, and merits close attention. It is often present when no complaint exists, while it is by no means an accompaniment of spontaneous pain. Its very absence is of consequence. Examinations made to elucidate it require gentleness and discretion, and often an especial knowledge of anatomy and physiology.

Tenderness in inflammation, especially when superficial, is of value in diagnosis. In neuralgic pain there is, on the whole, freedom from tenderness. Pressure, indeed, often relieves it. So, when associated with a particular nerve, pressure may differentiate between inflammatory trouble and a merely functional disorder. Actual neuritis gives rise to tenderness. Pressure will relieve muscular rheumatism when not of inflammatory type. Malignant growths are usually accompanied by pain and tenderness, while those of benign character are free from such symptoms. Destructive changes may be heralded by tenderness, as in diseases of the joints, in pressure from aneurysm or other tumor when there is, at the same time, spontaneous pain. Limited and obvious pain may indicate the presence of a foreign body. Localized tenderness on percussion is an important symptom in cerebral tumor. Tenderness is of value in diagnosis when there is no complaint by the patient, as in limited, obscure diseases of the abdomen, such as cancer, ulceration, or suppuration. It may also lead to undetected suppuration elsewhere. In children manifestations of pain during examinations will indicate the locality of morbid processes, and may lead to useful information. General tenderness is a striking symptom of rickets.

Acute erythema, erysipelas, peritonitis, gout, and spinal irritation are some of the affections in which tenderness is present. Other conditions are corns, bunions, chilblains, neuroma, superficial and multiple neuritis, stumps after amputation, boils, whitlows, felons, etc., and many affections of the eye and of the matrix of the nails.

Treatment.—As a rule, treatment of the disease with which tenderness is associated will relieve the tenderness itself. All pressure is to be avoided, as from clothing and bedclothes. Cradles to lift off the coverings may be used. Hot and cold applications, anodynes, and allied agents may be applied locally.

TENESMUS.—Rectal or vesical pain, with spasmodic contraction of the sphincter ani or sphincter vesicæ. The painful desire to empty the bowels or bladder without the evacuation of feces or urine.

Rectal tenesmus is a marked feature of dysentery. It may also be associated with other local diseases of the lower part of the rectum and anus, such as piles, fistula, or malignant diseases. Cystitis and pressure upon the bladder are causes of vesical tenesmus.

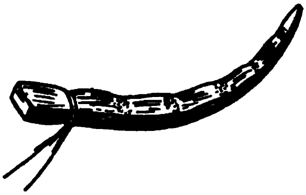
Treatment.—Local causes must be removed or cured, when practicable. Moist applications of heat and cold, or small enemata containing laudanum, or suppositories with morphin, extract of belladonna, or cocain hydrochlorid will often relieve the condition. See Cystitis, Dysentery, etc.

TENIA.—A genus of parasitic worms of the class cestoda (tape-worms). They form ribbon-like stocks, composed chiefly of a row of consecutive segments progressively increasing in size posteriorly (*proglottides*), and arising by strobilation from the knob-like head (*scolex*) which is provided with organs of adhesion. Over 300 species are recognized, having for their hosts very widely separated animals, with correspondingly wide geographic distribution. See Worms (Tape-).

TENIAFUGE.—See Anthelmintics.

TENSION.—See Eye (Examination).

TENT.—An instrument made of compressed sponge, laminaria, slippery elm, tupelo, or other material that increases in volume by the absorption of water; it is used chiefly for dilating the cervix of the uterus. When lodged in the uterus, laminaria slowly expands the cervical canal, which in this way usually becomes accessible to the finger for diagnostic purposes. The value of the agent in the main relates to the management of some of the consequences of abortion, or the postpartum retention of the products of conception. It is largely employed by some practitioners in facilitating the application of local remedies to the endometrium. The use of the tent is always accompanied by risk, and it should not be employed without extreme caution. It must not be introduced into the uterus when there is any evidence of pelvic inflammation.



Slippery-elm Tent

TEREBENE. $C_{10}H_{16}$.—A hydrocarbon obtained by the oxidation of oil of turpentine by means of sulphuric acid. It is soluble in alcohol and is recommended for winter cough as an expectorant, and for inhalation in bronchitis. Dose, 5 to 15 minims on sugar or suspended in water.

TEREBINTHINA.—See Turpentine.

TERPENE.—One of a number of hydrocarbons analogous to turpentine oil. They have the formula $C_{10}H_{16}$, or $(C_5H_8)_n$, and are contained in the volatile or ethereal oils obtained in the distillation of various plants (chiefly *Coniferæ* and *Citrus* species). The terpenes that have been thus isolated are very numerous.

TERPIN HYDRATE. $C_{10}H_{18}(OH)_2.H_2O$.—Obtained by distilling oil of turpentine with an alkali. Useful in bronchial and pulmonary diseases to loosen and facilitate the expectoration of mucus. Dose, 1 to 5 grains.

TERPINOL.—An oily substance formed by boiling terpin and terpin hydrate with aqueous mineral acids. It is a thick liquid, with a peculiar odor, boiling at 215–218 °C. Its uses are similar to those of terpin. Dose, 2 to 5 grains.

TESTICLE, ABNORMALITES. Absence.—Complete absence of the testicle is sometimes seen, and such a subject presents the ordinary appearance of a eunuch. A well-developed seminal vesicle and vas deferens have been found with no trace of testicle, and vice versa.

Supernumerary testicles have been described, but they are usually found to be fatty or fibrous tumors of the cord, old epiploceles, or encysted hydroceles.

Malposition.—The abdomen, inguinal canals, or the perineum may be the retaining place of the testicle, or it may lodge in the subcutaneous tissue of the upper thigh or be in the inner and upper part of the thigh; or it may be so rotated in the scrotum that the epididymis is in front; or it may be there completely inverted. When there is malposition in the scrotum, it must have been caused by some abnormality in the development of the cord. The consequences of retention in the abdomen are arrest of development, sometimes fatty, fibrous or malignant degeneration, or, if otherwise normal, failure to secrete a fertilizing fluid.

Retention in the Inguinal Canal.—Retention in the inguinal canal is often accompanied by inguinal hernia, and when inflamed at puberty, causes great pain from the distention of surrounding parts. In such cases peritonitis may cause the swelling to simulate a hernia. The testicle retained in the inguinal canal may be mistaken for a strangulated bubonocele or for a bubo. Retraction may be differentiated from retention by comparison with the state of development of the corresponding side of the scrotum. A perineal or femoral position of the gland is not necessarily attended by any bad result.

When the gland in the inguinal canal is attended by inconvenience, it may be placed in the scrotum by operation. Extirpation may be necessary if, from shortness of the cord, this is impossible. Trusses are not to be recommended for infants, even when malposition is complicated by inguinal hernia, as the hernia frequently subsides, and the truss will then interfere with descent of the testicle. When it has passed through the crural ring, the malposition cannot be remedied. If in the perineum or thigh, the testicle may be placed in the infantile scrotum by operation. Malpositions in the scrotum are important only from the standpoint of operations, as for hydrocele, etc. Arrest of development sometimes occurs even after the testicle has passed into the scrotum, but with no serious consequences.

Atrophy.—Rupture or ligation of the spermatic artery, and occasionally acute orchitis (especially that variety which is associated with mumps), are the chief causes, the testicle shrinking to a small nodule. Rupture or ligation of the vas deferens, chronic epididymitis, the pressure of ill-fitting trusses, and abuse may be followed by the same effect; but the wasting is seldom so extreme. Whether it is ever a result of varicocele is doubtful, though this is so often associated with a soft and flabby condition of the gland.

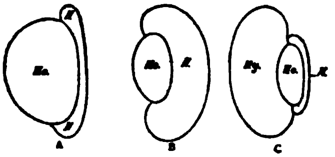
Hypertrophy is said to occur as compensation in cases of unilateral retention.

TESTICLE, HERNIA.—This condition is also known as "benign fungus of the testis," and may be superficial or deep. It is recognized as a fungus protrusion from the scrotum, the size of a pea, or even of a small egg, red or yellowish-red in color. In the deep form the tunica albuginea has been perforated, and seminal tubules form the greater part of the mass. It may occur after any form of suppurative orchitis.

Treatment.—Well-adjusted pressure and applications of silver nitrate or mercuric oxid may suffice. Freeing the margins of adhesions and suturing the over-stretched skin is usually very successful. If due to specific cause, antisyphilitic treatment is indicated.

TESTICLE, INFLAMMATION (Orchitis; Epididymitis).—Acute inflammation of the testicle is generally spoken of as orchitis or as epididymitis, according as the body or the epididymis is primarily or chiefly affected.

Etiology.—Gonorrhea is the most frequent cause; but injury of the testicle, or irritation of the prostatic urethra, as from the tying-in of a catheter, or from the impaction of a calculus or fragment of a calculus, are not uncommon causes. Orchitis sometimes occurs during an attack of mumps, and is then said to be due to metastasis. It has also been attributed to the use of strong injections for the cure of gonorrhea. In what manner inflammation of the testicle is induced by the irritation of the urethra is disputed. It is variously taught, however, that it is due to (1) inflammation spreading along the vas; (2) reflex irritation; and (3) metastasis.



Diagrammatic sections of (A) Orchitis, (B) Epididymitis, and (C) Hydrocele of the Tunica Vaginalis. *Ho*, Testis; *N*, Epididymis.—(*Tillmanns.*)

Symptoms.—In a well-marked case there is intense pain in the testicle, with a dragging or aching pain in the groin and along the course of the cord. The testicle is swollen, and is exquisitely tender to the touch; the cord is slightly thickened; and the skin of the scrotum is edematous and of a dusky red color. When the inflammation is in the epididymis, the pain and swelling will be chiefly confined to the lower and back part of the testicle—the region of the epididymis—and fluid will often be detected in the tunica vaginalis. If the inflammation of the testicle occurs during an attack of gonorrhea, the discharge generally ceases or diminishes when the inflammation is at its height. The local signs are often accompanied by sharp febrile disturbance, elevated temperature, furred tongue, nausea, or even vomiting, and constipation.

Treatment.—When the attack is acute, rest in bed, with the testicle supported on a pillow, is desirable. Cooling lotions, such as lead water and laudanum and a weak alcoholic solution of ammonium chlorid are time honored applications. Hot moist compresses sometimes afford relief when cooling lotions fail. Recently hot saturated solution of Epsom salt has been highly recommended. Another much esteemed application is 25 percent guaiacol in olive oil or glycerin, painted over the affected half of the scrotum once or twice daily. Internally, a brisk purge should be given at the onset, followed by saline laxatives and small doses of antimony. If the pain is very severe, opium may be given. Urethral treatment must be stopped.

If the effusion into the tunica vaginalis is extensive, a few punctures may be made with a fine tenotomy knife, or an ordinary trocar and cannula may be introduced; and if the veins of the scrotum are distended, they may be pricked and encouraged to bleed, or leeches may be placed over the inguinal canal; but, although it is largely practised by some surgeons, and apparently with impunity, puncture of the testis itself is not advisable.

After the acute stage has subsided a properly fitting suspensory bandage should be worn. Martin's epididymitis bag is the most satisfactory American appliance.

After the skin has been lightly anointed with vaselin, the suspensory bandage is lined with cotton and so adjusted as to raise the scrotum toward the abdomen. The degree of pressure can be regulated from time to time according to the amount of swelling and tenderness of the organ.

An effort should always be made to secure resolution of the nodules which persist after the acute inflammation has entirely subsided. For this purpose the application of compound iodin ointment or oleate of mercury is useful, the latter applied very sparingly so as not to produce great irritation of the integument. Iodin internally has been thought by some to favor resolution. Given in the form of syrup of hydriodic acid it will rarely, if ever, cause gastric irritation.

Traumatic orchitis may be treated in the same way. When due to metastasis, warm fomentations are better from the first; and if there is much infiltration of the scrotum, so that the condition of the circulation is doubtful, or if the patient is old and feeble, cold should not be used, for fear of gangrene.

Chronic Inflammation.—This may begin as such or may be the relic of an acute attack. When confined to the body of the testis, it is nearly always due to syphilis; gout and malaria are exceptional causes. If the epididymis only is concerned, it is probably tubercular or urethral, and in the latter case it may be either the remains of an acute attack or chronic from the first. Syphilis occasionally affects the epididymis only (in the early secondary period), and not infrequently both epididymis and testis.

Symptoms.—The testicle appears enlarged, smooth, laterally compressed, egg-shaped, hard, heavy, and painful on pressure; the testicular sensation is not lost; the vas is but slightly thickened; the skin is nonadherent, and the epididymis (except when the disease is limited to that part) is not distinguishable from the body of the organ. In chronic epididymitis an indurated, painful, and tender lump is felt in the situation of the globus minor or major.

Treatment.—Mercury or potassium iodid should be given internally, and the enlarged organ may be strapped. Mercurial inunctions are also of value.

Tubercular disease of the testicle, also known as strumous orchitis, or strumous sarcocele, is variously believed to depend upon the presence of the tubercle bacillus, or upon a chronic inflammation in a strumous subject; and to begin either as a tubercular affection in the intertubular connective tissue or as a catarrhal inflammation in the interior of the tubules.

Pathology.—Opportunities for examining the testicle in the early stages of the disease are not common, and there is uncertainty as to the origin and exact nature of the inflammation.

Symptoms.—The disease usually begins very insidiously. The epididymis, especially the head, and, later, the body of the tesicle are found enlarged. The testicle is usually but slightly tender to the touch, and the testicular sensation is not lost; a hydrocele may be present or part of the tunica vaginalis may be obliterated. Subsequently, the cord, especially the vas, becomes thickened and the skin adherent; while still later the skin may give way and a fungus, composed of the infiltrated tubules, may protrude or a discharging sinus may be produced. When the testicle becomes adherent to the skin, soreness and pain will develop as the initial manifestations of the long-existing disorder. The seminal vesicles or prostate may now be felt enlarged on examining by the rectum, and bladder or urinary disorders may set in; while symptoms of tubercle in the lung, larynx, or other organs may supervene, and the patient may succumb to tubercular disease. At other times no constitutional signs manifest themselves, and the patient may completely recover.

Diagnosis.—From syphilitic orchitis it may generally be distinguished by the enlargement of the epididymis, thickening of the cord, adhesion of the skin, enlargement of the seminal vesicles and concomitant signs of tubercle elsewhere.

Treatment.—In the early stages, before the vas or seminal vesicles have become involved, some surgeons advise castration or resection of the epididymis for the purpose of preventing, if possible, general dissemination of the disease; and when both testicles are affected, even the removal of both. Others, however, rely on constitutional, hygienic and climatic treatment, and only advise the removal of the testicle should it become destroyed by the disease. If the seminal vesicles are found affected in the early stages, or if signs of tubercle are discovered in other parts, the testicle should, of course, on no account be excised.

The *constitutional treatment* is that of tuberculosis.

The *local treatment* consists in suspension of the organ, avoidance of horseback riding or other violent exercise, and recumbency during an exacerbation of the inflammation. Should the tubercle soften and suppuration occur, the abscess must be opened and the wound dressed with iodoform or other antiseptic. If intractable sinuses remain, they should be scraped with a Volkmann's spoon. If a fungus forms, it will frequently recede under rest in bed, cleanliness, and the application of a stimulating ointment or of iodoform. Should the testicle become completely disorganized, it had better be excised.

Syphilitic Inflammation.—Subacute epididymitis, may occur in the early secondary stage, a painful irregular swelling making its appearance at the back of the testicle, involving the cord to a slight extent. It never possesses the severity of urethral epididymitis; the skin may be reddened, but is not edematous; and, like the other secondary symptoms with which it occurs, it subsides rapidly under mercury.

True orchitis appears later, either during the intermediate period (when both glands are involved), or with the tertiary symptoms, when one gland is often attacked long before the other. As a rule, it does not affect the epididymis or the cord, and is very chronic in its progress; but often, in neglected cases, after the first testicle has been enlarged for some time, the second suddenly becomes actually inflamed, the skin grows hot and red, the tunica vaginalis distended, the epididymis affected as much as the testis, and the pain so severe that the patient is compelled to apply for relief.

Symptoms.—The character of the swelling depends upon the distribution of the syphilitic exudation and upon the changes it undergoes. In some cases, especially the earlier ones, there is uniform enlargement of the whole gland, so that it remains ovoid, smooth, and even, and merely becomes heavy and intensely hard; in others the surface is nodular and uneven in consistence, dense indurated patches alternating with others that are soft and elastic. The exudation, in other words, may be uniformly distributed throughout the whole of the fibrous tissue of the gland, or it may be aggregated either into one central gumma or into numerous scattered gummata of various sizes; and, according to the success of the treatment, it may be completely absorbed, merely leaving a slight depression, or may become organized into cicatricial bands, or may break down and undergo caseation and liquefaction. Occasionally, this ends in suppuration and hernia testis; more frequently, partial absorption takes place, and a hard, irregular mass is left, sometimes in the middle, sometimes at one side of the testis, composed of a caseous or even calcareous center, surrounded by an immense thickness of cicatricial tissue—a so-called chronic abscess.

The size to which a testicle may attain under these conditions is enormous; usually, when, large, it is painless and is devoid of testicular sensation. Heat, redness, thickening of the cord, edema of the skin, and effusion into the tunica vaginalis are signs of acute inflammation, and are only present when the testicle is first attacked or when a fresh gumma suddenly develops. Cases of this kind have lasted for 10 years, with occasional subacute attacks compelling the patient to apply for relief, until at length the testicles were enormously enlarged, irregular in shape, hard, painless, and absolutely devoid of sensation.

The diagnosis of syphilitic orchitis is rarely difficult; the only form that resembles it is that occurring in gout. The chief features are the essentially chronic character of the affection (varied from time to time by more acute attacks); the smooth, hard, heavy character of the swelling; the disappearance of the epididymis, which in many instances is so flattened out that it cannot be felt (occasionally, it is enlarged); the absence of pain (during the greater part of the time) and of testicular sensation; and the fact that both testes are involved, though usually not to an equal degree.

Treatment.—In epididymitis and recent orchitis mercury may be given freely, with a view to causing speedy absorption; later, especially if the disease has relapsed, more benefit is derived from small doses of bichlorid of mercury, continued with occasional interruptions. Iodid of potassium always causes a rapid diminution in size, but absorption of the syphilitic exudation is rarely complete; it progresses up to a certain point, continues as the dose is increased, and then comes to a standstill, leaving a dense mass, over which nothing appears to have any influence. The acute symptoms, however, are quickly relieved by it. Occasionally, other remedies are of service: mercury, for example, rubbed into the skin on the inner side of the thigh (it cannot be applied to the scrotum), strapping, or the removal of hydrocele fluid. If suppuration occurs, the abscess must be opened; and at length, if the testis becomes useless and is a constant source of pain and suffering, castration may be advisable.

TESTICLE, PAIN.—Pain and retraction of the testicle are of frequent occurrence in disease of the kidneys and in affections involving branches of the lumbar plexus; further, after obliteration of the vas, sexual intercourse, or even sexual excitement, may be attended by severe pain and swelling of the gland; in addition to this, however, in certain persons the testicles are liable to attacks of intense neuralgia, coming on at regular intervals or excited by the most trivial irritant. Usually, one only is affected, but both may be; the gland may be apparently well nourished, or it may be small and flabby; it may be exceedingly irritable, resenting the slightest touch, or there may be nothing noteworthy about it. In many cases there is a history of injury, but it seldom stands cross-examination. Gout, malaria, anemia, and other constitutional ailments are sometimes present. Neuralgia of the testicle may occur in the most continent; and though in many there is a history of abuse, it is difficult to connect one condition directly with the other. Sexual hypochondriasis may be associated with it, and often the family history is decidedly neurotic.

Treatment is very unsatisfactory. Any local or constitutional cause that can be detected must, of course, receive thorough consideration; a suspensory must be worn; lead or some other cooling lotion should be applied; and the thoughts and ideas directed into other channels. Cupping over the loins, massage of the back, and the free (local) use of anodynes may be tried as well. If there is a large varicocele, operation may give relief, but castration is useless.

TESTICLE, REMOVAL.—See CASTRATION.

TESTICLE, TUMORS. Hematocele.—See HEMATOCELE.

Hydrocele.—See HYDROCELE.

Dermoid and hydatid cysts are occasionally met with. The former may be recognized by their congenital origin, though often they do not attain much prominence until late in life, and their uneven consistence; but no certain diagnosis can be made without puncture.

Cystic adenoma is more common. Like parotid glandular tumor, it is peculiar to the organ from which it springs, and only admits of a somewhat vague comparison with other growths. It consists of cysts of all sizes, lined with cubic or flattened epithelium, filled with a clear brownish or greenish fluid, and developed from the seminiferous tubules, the epithelium of which has either lost or has never acquired its distinctive characters. A variable amount of fibrous tissue exists between them, sometimes undergoing myxomatous degeneration, and occasionally mixed with cartilage. Intracystic growths may occur as well. Tumors of this kind may occur at any age, but they are rarely noticed before puberty. Growth is slow and painless, the patient suffering no inconvenience other than that due to the weight. The vas is never affected, and secondary deposits do not occur, the cases in which this is said to have taken place having really been sarcomata, with an accidental development of cysts.

Fibroma and enchondroma of the testis are met with in young adult life, but they are both very rare. The chief clinical feature is the slow growth of a hard and heavy painless mass. The surface is usually smooth, but it may be nodular, suggesting the presence of cysts. Growths of this kind do not extend along the cord, invade other organs, or recur; but removal is always advisable. There is no means of distinguishing one from the other but by a section.

Carcinoma of the testis is nearly always encephaloid, though a few cases of scirrhus have been described. It is stated to be most common between 20 and 40 years of age. The beginning is usually very insidious; the testis is enlarged, smooth, ovoid, and at first fairly firm; the cord is not thickened, nor are its components matted together, but it is fuller than the other, and the veins over the scrotum are distended. There is little or no pain or tenderness, and testicular sensation is soon lost. In a very few weeks there is a rapid increase in size; the tumor is softer, the surface uneven, the cord distinctly thickened, the shape becomes globular and the epididymis flattened out at the back. If left, it becomes so soft that it almost seems to contain fluid; the skin becomes adherent, the veins are more distended, the thickening extends higher up the cord, and, perhaps, if the patient is thin, an ill-defined sense of resistance can be made out by deep pressure at the back of the abdomen. The skin of the scrotum soon gives way, allowing a bleeding mass to protrude, the glands of the groin enlarge, secondary deposits make their appearance in other organs, and the patient sinks rapidly from exhaustion.

Sarcoma of the testicle presents greater variety of appearance and character. It may be round-celled or spindle-celled, and the latter especially may become more or less converted into cartilage (without, however, losing one atom of its malignant sarcomatous character); sometimes there are only nodules here and there, sometimes branching outgrowths—due, perhaps, to the spreading of the disease inside the lymphatics—and occasionally so much that the original sarcomatous growth is hard to find. In addition both of these forms may be associated with cysts, due either to softening and hemorrhages or to distention of the seminiferous tubules, with proliferation of the epithelium lining them, and occasionally intracystic growths, so that they may present a close resemblance to some of the forms of cystic adenoma. Sarcoma may occur at any age, even before birth, though it is most common under 10 years and between 30 and 40. The round-celled variety, unless the patient is a child, or unless both testicles are attacked at once, cannot be distinguished from encephaloid carcinoma; the progress is as rapid, and the glands of the lumbar and other regions are involved as soon; if possible, it is even more fatal. The other variety is much less uniform in rate of growth and consistence; it may, for example, be formed almost wholly of cartilage or of fibrous tissue; cysts are less common, and it does not appear to fungate so readily; but the ultimate results—the infiltration of the glands with growth of the same histologic character as the primary one, and the secondary deposits in the lungs and other organs—are equally certain.

Teratomata.—These are congenital tumors containing embryonal tissue elements from the three blastodermic layers. Dermoid cysts also belong to this class. Many of these tumors are exceedingly malignant, especially those which contain tissue resembling chorioepithelium.

Treatment.—Sarcoma, carcinoma, and the teratomata should be removed as soon as the diagnosis is made. The usual operation of castration is inadequate for the removal of malignant tumors of the testicle. Although it is impossible to reach the lymphatics which drain the testicle at their termination, they should nevertheless be divided as high up as possible.

Following the method of Cumston and Rolfe an incision is made parallel to, and about three quarters of an inch above, Poupart's ligament, the inguinal canal laid open, the cord freed and lifted out. The iliac fossa is then entered by an opening made through the posterior wall of the canal. The vas is followed downward into the pelvis as far as possible, cut, and the stump touched with pure carbolic acid. The spermatic vessels are then traced upward as far as possible, ligated in two places and divided between the ligatures. The cord is separated from its coverings from above downward to a point below the external ring. The testicle may be pushed up and removed with the cord unless it is very large, when a longitudinal incision down the scrotum is required for its removal. The prognosis is very unfavorable, but in all probability this is due in some measure to delay; there is evidence to show that if castration is performed in time, recurrence may not take place for many years. Even if the skin is involved and the cord thickened, the operation is advisable in order to save the patient from the formation of a fungus, if only there is reasonable prospect of securing immediate union of the wound.

Diagnosis of Tumors of the Testes. *Age.*—A tumor that appears in infancy is probably hydrocele; sarcoma and syphilitic and tubercular orchitis occur, but are very rare in comparison.

Etiology.—A definite history of accident deserves consideration, though it may merely have drawn attention to an already existing, but unsuspected, enlargement. Sarcoma as well as hematocele may follow injury.

Rapidity of Growth.—Hematocele is an affair of minutes, or, at most, of hours; malignant disease, of a few weeks. Acute orchitis presents no difficulty in diagnosis; chronic inflammation, on the other hand, if only one side is involved, if there is no evidence of constitutional complaint, and if there are but little heat or pain and no redness, can often be diagnosed only by the results of treatment. Syphilitic orchitis, for example, may, so far as a single examination is concerned, be indistinguishable from incipient malignant disease.

Duration.—If the tumor has lasted more than 6 months without the doubt in diagnosis clearing up, it is not malignant.

Consistence, whether solid or fluid. Hydrocele and hematocele are the only fluid tumors at all common, but there are many sources of fallacy. A hydrocele may conceal an enlargement of the testes (hydrosarcocele). Old hydroceles and hematocele may have walls of such thickness as to appear solid, and rapidly growing malignant tumors may be as soft and elastic as if they contained fluid.

Translucency.—This distinguishes at once thin-walled hydroceles.

Number.—Hydrocele and sarcoma may occur on both sides, but when both testes are affected, the tumor is nearly always of inflammatory origin.

Shape.—If the tumor retains the shape of the testis, it is probably either chronic inflammation or incipient malignant disease. Sarcoma and carcinoma (when more advanced), hematocele and encysted hydrocele, are all spheric; other tumors are very irregular.

Pain and Sensitiveness.—Hematocele may be very painful at first; the others—except acute inflammation— are rarely attended by pain. In chronic orchitis, malignant disease, and hematocele testicular sensation soon disappears.

The Condition of the Cord.—In chronic orchitis, hydrocele, and hematocele, the cord is not affected. In acute inflammation and incipient malignant disease it feels full because of the increased amount of blood. In acute epididymitis and advanced sarcoma and carcinoma it is thickened and all its component structures are welded together. The vas itself is enlarged in tubercular epididymitis. The skin is not adherent unless there is acute inflammation or advanced malignant disease (Moullin).

The following table, from Keyes and Stewart, shows the main points in the diagnosis of chronic diseases of the testicle:

	Simple Chronic Epididymitis.	Tuberculosis.	Syphilis.	Tumor.
History............	Gonorrhea, stricture, or hypertrophy of prostate.	Tuberculosis, family or personal.	Syphilis inherited or acquired.	Perhaps trauma.
Frequency..........	Uncommon............	Frequent..............	Frequent..............	Rare.
Size................	Small between attacks...	Does not reach any great size.	Does not reach any great size.	May reach any size.
Tenderness..........	Yes..................	Yes..................	No..................	No.
Shape.............	Between attacks testis normal, epididymis nodular.	Epididymis nodular. Testis not involved unless acute or ancient.	Testis evenly enlarged, slightly nodular, "clam shell" epididymis.	Testis greatly enlarged, no characteristic involvement of epididymis.
Cord..............	May be slightly thickened.	Enlarged and nodular...	Free..................	Free.
Seminal vesicles.....	Usually distended......	Tuberculous...........	Uninfluenced..........	Uninfluenced.
Prostate...........	Posterior urethra inflamed.	Congested or tuberculous.	Uninfluenced..........	Uninfluenced.
Urine..............	Cloudy...............	Cloudy, may contain bacilli.	Clear.................	Clear.
Hydrocele..........	Unusual..............	Often.................	Nearly always.........	Unusual.
Onset.............	Usually acute..........	Usually chronic........	Chronic..............	Chronic.
Age...............	Adult life.............	Not often after 30......	Middle life............	Any age.
Origin.............	Epididymis............	Epididymis............	Testicle..............	Testicle.
Course............	Recurring acute attacks.	Chronic..............	Very chronic..........	Usually rapid.
Suppuration........	Unusual..............	Common..............	Rare.................	None, but fungus common in later stages.
Atrophy of testis....	Rare, potency unimpaired.	Rare, potency somewhat impaired.	Common, potency somewhat impaired.	Never, potency unimpaired.
Opposite testicle.....	Often involved simultaneously.	Usually involved subsequently.	Free..................	Free.

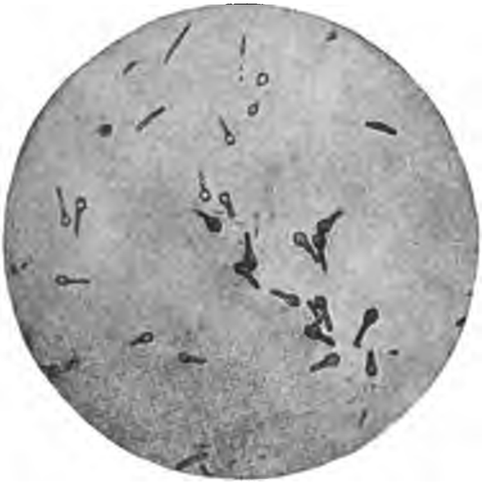
TESTICULAR EXTRACT (Orchitic Extract).—This substance has been recommended as a general tonic for the aged, for subjects of impotence, or for a debilitated nervous system. It has been used in general adynamia, anemia, atonic gastrointestinal affections, scurvy, malaria, epilepsy, cancer, nymphomania, perverted sexual habits, impotence, neurasthenia, hysteria, melancholia, diabetes, tuberculosis, hemiplegia, paralysis agitans, and locomotor ataxia.

It is prepared in the following manner: The testicles of bulls, enveloped in their membranes, are washed in a 10 percent solution of sublimate, and again with sterilized water, are each divided into 5 or 6 parts, placed in aseptic glycerin (a pint to the pound of testicle), and allowed to macerate therein for 24 hours. An equal quantity of a 5 percent solution of common salt in boiled water is then added, and the mixture is filtered and sterilized by being subjected to a pressure of 30 atmospheres of carbonic acid gas. The dose is from 10 to 20 minims hypodermically, once daily or every other day, with strict aseptic precautions as to the syringe used and the site of injection; the latter should be washed with a 1:1000 sublimate solution or with a 2 percent solution of carbolic acid. The extract seems to have little or no effect when given by the mouth, but is efficient when administered by the rectum.

TESTIMONY, MEDICAL.—See EXPERT TESTIMONY.

TESTS.—See URINE (Examination), BLOOD (Examination), SPUTUM, STOMACH-CONTENTS, BACTERIOLOGY, PATHOLOGIC TECHNIC, VISION (Tests), HEARING (Tests), etc.

TETANUS (Lock-jaw; Trismus).—An infectious disease, marked by tonic spasms of the voluntary muscles, with distinct exacerbations. The contractions may be confined to the muscles of the lower jaw (trismus) or to certain other groups of muscles, or they may involve the muscles of the whole body. Tetanus may occur at any age. It is often epidemic among children. Males suffer oftener than females by about 4 to 1.



BACILLUS OF TETANUS, SHOWING SPORES.—(*Fränkel and Pfeiffer.*)

Etiology.—Tetanus is caused by a specific bacillus—the tetanus bacillus, first discovered by Nicolaier, and first obtained in pure culture by Kitasato. It is present in surface soil and dust. This explains the fact that wounds which have been infected by dust or earth are so often followed by tetanus.

This bacillus is long, slender, and swollen at one end in the shape of a "drumstick," in which a spore develops. The germ is generally isolated or in pairs, and is motile, but has no flagella. The bacillus of tetanus is anerobic. It is exceedingly resistant to the action of heat and to that of carbolic acid solution. It grows upon artificial culture mediums, such as gelatin, bouillon, and with gelatin containing glucose.

Men, horses, mice, rabbits, and guinea-pigs are all susceptible; birds and dogs are less so, while the frog is immune. It is said, however, that if the body temperature of the frog is increased it becomes susceptible. The bacillus of tetanus stains well with all the ordinary aqueous solutions of anilin dyes and by Gram's method.

Symptoms.—At first the patient finds stiffness in the movement of the jaw; he experiences uneasiness in swallowing, and soon perceives that he has difficulty in separating his teeth for the admission of food. He begins, now, to feel pain behind the sternum, and this pain extends from the pit of the stomach toward the vertebral column. The muscles of the back and those of the back of the neck begin to be affected by spasms; then those of the abdomen, afterward those of the limbs, and lastly those of the face. The muscles become more and more rigid as the case proceeds. In the extreme period of the disorder all the muscles of voluntary motion are affected; among others, those of the face; the forehead and nose are drawn up; the eyes are distorted, fixed, and motionless; the cheeks are retracted, and the features undergo an extraordinary change. The spasms become universal, and a violent convulsion puts an end to the misery of the patient.

Profuse sweating usually occurs during a paroxysm. The temperature in some cases is normal throughout; in others there is marked pyrexia from the outset, the temperature reaching 105° or 106° F. before death, and being 109° or 110° F., and even higher, soon after death. When death occurs, it is usually due to exhaustion, inanition; spasm of the diaphragm, or the muscles of respiration; spasm of larynx, with asphyxia; arrest of heart action from spasm or paralysis.

Diagnosis.—The symptoms are so characteristic, with the addition of a history of a wound, that an error seems hardly probable.

Tetany.—The spasms chiefly affect the extremities, the muscles being free in the interval and trismus a late or very rare condition.

Strychnin poisoning often closely resembles tetanus, but there is no beginning trismus and there is more rapid development of the symptoms. No history.

Hydrophobia does not have trismus; but respiratory spasm occurs, excited by attempts at swallowing, with increasing mental symptoms.

Prognosis.—In the acute form the prognosis is very grave; in the chronic form it is favorable.

Treatment.—The indications are to keep up the strength of the patient until the disease ceases; to remove, as far as practicable, all conditions believed to have the power of creating the tetanic state; and to employ any sedative or special treatment from which it may be hoped to derive advantage. Perfect quiet is absolutely essential; the room should be darkened, and the patient kept, as nearly as may be, in perfect repose; remedies should be administered as gently as possible; everything harsh or violent should be avoided. If nourishment cannot be swallowed, it should be administered through the anus; it should be as plentiful as the nature of the case will admit; the supply of brandy and wine should be abundant. Quinin and iron should be freely administered; opium and morphin have, in many cases, been serviceable; chloral hydrate, chloroform, Indian hemp, and tobacco have all been tried in turn, and sometimes with success. Hydro bromid of hyoscin has recently been highly recommended in the treatment of convulsions. Large doses of bromid of potassium and chloral are also used. Should suffocation be threatened from spasm of the glottis, inhalations of nitrite of amyl should be resorted to: the usual quantity administered is from 5 to 10 minims. From a physiologic standpoint, calabar bean is the drug that deserves the most attention, as it is antagonistic to the tetanic spasms caused by strychnin. It has, however, not proved to be a specific for tetanus. Extract of physostigma, 1/8 grain, may be given every hour until complete contraction of the pupil occurs, and this must be followed by stimulants to counteract the resulting depression.

Intraspinal injections of magnesium sulphate suggested by Meltzer have been used with success in some cases. The danger of respiratory paralysis is combated by the administration of oxygen and artificial respiration long continued if necessary.

Specific Treatment.—This consists in the use of the antitetanic serum along with the other treatment. The dose is 10 to 20 c.c. of fresh serum, every 4 to 12 hours according to the severity of the symptoms. Results have not been better because generally the treatment is begun too late. In any suspected case the serum should be administered at the earliest possible moment after the infliction of the wound. As tetanus antitoxin is harmless it should be used as a prophylactic measure, a dose of at least 5000 units being given. The subarachnoid injections of magnesium sulphate should be used in connection with the injections of tetanus antitoxin.

TETANUS ANTITOXIN.—See SERUM THERAPY.

TETANUS, INFANTILE.—Tetanus occurring in infants, as in adults, is an acute infectious disease due to a certain bacillus (Nicolaier's bacillus) which has its habitat in the soil. The germ of tetanus usually gains access to the body of the infant through the umbilical wound. Tetanus is rare except when dirt and filth prevail, but these alone are not sufficient to produce the disease.

Symptoms.—These usually begin on the fifth or sixth day or at the time of the separation of the cord. The first symptom may not appear before the tenth or twelfth day, but seldom later, and the first thing noticed is a difficulty in nursing, due to the rigidity of the jaws. The muscles of the jaws and face are hard and firm. Soon a slight stiffening of the body occurs, the child remaining rigid for a short time, but relaxing during the intervals. These paroxysms soon increase in extent and frequency; the whole body becomes rigid and stiff; the arms are extended, the thumbs turned in, and the hands clenched. The thighs and legs are extended and no motion is possible at the hip or knee. The jaws may become firmly closed, and food cannot be taken. The pulse is rapid and weak, the temperature is more or less elevated (101° to 104° F.). The duration of fatal cases is very short (24 to 48 hours); but when recovery takes place, which is rare, the disease continues from 1 to 3 weeks, and the child usually suffers from malnutrition for some time longer.

Treatment.—The preventive treatment consists in obstetric cleanliness and in especial care, in districts where tetanus is epidemic, that the cord is kept in a perfectly aseptic condition. Tetanus antitoxin should be given as soon as the slightest suspicion of the disease exists. The child should be kept in a very quiet, darkened room. During severe paroxysms inhalations of chloroform should be given until the patient is quiet. When the mouth cannot be opened, it may be necessary to introduce a wedge, so that nourishment can be taken.

When unable to swallow, food should be introduced through a stomach-tube, which, when it cannot be passed through the mouth, may be inserted through the nose. Chloral hydrate should be given, and often large doses will be necessary. Beginning with 1 grain every hour, this may be increased, if the effects are not marked. The chloral should be well diluted in water, and may be given by the mouth or rectum. Extract of physostigma in 1/10-grain doses should be given hypodermically 3 times a day, or more frequently if necessary.

TETANY.—Tetany is a form of tonic muscular spasm, affecting most commonly the muscles of the extremities, especially those of the hands and feet. It may occur at any age, but is most frequent during infancy.

Etiology.—Tetany rarely occurs as a primary disease, but when occurring in infants, it is, in a majority of cases, associated with rickets, although in some cases it occurs with marasmus, chronic diseases of the intestinal tract, or some of the acute infectious diseases. The principal exciting cause is some irritation of the gastro-intestinal tract, as acute diarrhea, worms, prolapse of the rectum, or intussusception. In some cases teething may be the exciting cause. It has been known to recur among school-girls as an epidemic, in this respect resembling chorea.

Symptoms.—The attacks consist of cramps of the muscles of the extremities. There is no loss of consciousness and, as a rule, no spasm of the facial muscles, but the face wears an expression of pain when the cramps come on, and the infant screams when it is touched. The legs and arms are flexed and rigid, and the hands and fingers are tightly flexed. The feet may assume various positions of flexion, such as that of talipes equinus or equinovarus. The duration of the disease varies from a few minutes to hours or days. There is no loss of consciousness and no fever with the spasms. Laryngismus stridulus is quite often associated with tetany, as are also general convulsions. Tetany of itself is seldom fatal, but the prognosis of any case must depend upon the original disease that tetany may complicate.

Diagnosis.—The diagnostic features of the disease are bilateral spasms without loss of consciousness, the spasm in infants being usually limited to the hands and feet.

Tetanus is to be distinguished from tetany by the fact that the former is a very rare disease, except in the new-born, etc., and that the attack begins with trismus, which does not occur in tetany. From meningitis tetany is distinguished by the fever and cerebral symptoms.

Treatment.—When tetany is due directly to some digestive disturbance, as is usually the case, this should receive attention. A dose of castor oil (1 to 4 teaspoonfuls) should be given to clear out the intestinal tract, or, for the same purpose, calomel, 1/6 grain every 2 hours.

If worms are suspected, the following should be given:

℞. Calomel, gr. j
Sodium bicarbonate,
Milk-sugar, } each, gr. vj.
Powdered santonin,

Make 12 powders, giving 1 every 2 hours, until 3 are taken, and repeat every other day.

For the attack a hot bath is very effective, and sodium or potassium bromid, in 5- to 15-grain doses, should be given until the child is quiet, but continuing the bromid in small doses as long as any nervous symptoms remain.

Following the attack, the child's general nutrition should receive careful attention.

TETRONAL. — Diethylsulphondiethylmethane. A disulphone of the ethyl and methyl groups, harmless in ordinary doses, and having marked hypnotic properties. Dose, 10 to 30 grains.

TETTER.—See Eczema.

THALLIN.—A synthetic chemic product and a derivative of coal-tar. It is a powerful antipyretic, but its effects are not so lasting as those of antipyrin. It is likely to produce collapse. Dose of thallin or its sulphate, about 5 grains.

THEA. THEIN.—See Caffein, Tea.

THEOBROMA.—A genus of plants of tropical America. *T. cacao* is the cacao plant, or chocolate tree. See Cacao-butter. T., **Ceratum** ("red-lip salve"), cacao-butter, white wax, of each, 35; oil of almond, 30; oil of rose, to flavor, and carmin, to color, a sufficient quantity of each. T., **Oleum,** butter of cacao. The fixed oil of the seed of the chocolate tree, *T. cacao.* It consists mainly of stearin, with a little olein, and is demulcent, not becoming rancid. It is used in making suppositories.

THEOBROMIN.—$C_7H_8N_4O_2$. An alkaloid occurring in the seeds of *Theobroma cacao* (1.5 percent), obtained from the pressed cacao mass by mixing with slaked lime and exhausting with 8 percent boiling alcohol. It is a white, crystalline powder, slightly soluble in water, alcohol, and ether. Theobromin is a homolog of caffein, differing in containing one CH_2 group less; it unites readily with alkalies, forming soluble salts. See Diuretin. Because of its insolubility, theobromin is unsuitable for use, but is employed in the form of a double salt. In physiologic action it resembles caffein, being, however, free from any irritating action on the nerve-centers. See Caffein.

Theobromin Salicylate.—$C_7H_8N_4O_2.CO_2.C_6H_4$-OH. This occurs in small, white needles having an acid reaction and an agreeable bitter taste, and being slightly soluble in water. It is recommended as a substitute for diuretin in the same doses. The advantages claimed over the latter are that it is perfectly stable, and is not altered by air, moisture, or carbonic acid. See Diuretin.

Theobromin Sodium Formate (**Thephorin**).—A powerful diuretic said to be free from irritant effects on the stomach. Dose, 7 1/2 grains.

Theobromin Sodium Iodid (**Iodotheobromin**).—A white powder, soluble in water, decomposed by hot water. Used to increase arterial pressure; also as a diuretic. Dose, 8 grains.

THEOCIN.—The trade name for synthetic theophyllin (dimethylxanthin), an organic base isomeric with theobromin. It is a white crystalline powder. Like theobromin it differs from caffein in having but little effect on the central nervous system.

Theocin has not so great a stimulant action on the heart as caffeine, but is a much more powerful diuretic than either caffein or theobromin. The diuretic effect, however, is not prolonged and its administration is, therefore, advantageously followed by one of the theobromin derivatives having a weaker, but more persistent, action. It occasionally produces gastric disturbances, and renal irritation has also been reported. In doses of 3 to 5 grains in warm tea, it is recommended in cardiac affections, nephritis, dropsy, etc.

The double salt, *acet-theocin-sodium,* being more soluble, is said to be more readily absorbed and better tolerated than theocin.

THERMODIN.—Phenacetin-urethane. An analgesic, antipyretic and antiseptic. It is said to be effective in typhoid fever and other febrile conditions, influenza, pneumonia, tuberculosis. It is claimed to produce no unpleasant by-effects. Dose, as an antipyretic, 5 to 10 grains, as an analgesic, 15 to 20 grains.

THERMOMETER.—An instrument for measuring the intensity of heat, consisting of a reservoir of mercury (or of alcohol) expanding into a vacuous capillary tube, the intensity being measured by the length of the column of mercury.

Varieties.—**Centigrade** (or **Celsius**), one in which the freezing-point is at 0° and the boiling-point at 100°. **Fahrenheit,** one in which the interval between freezing and boiling is divided into 180 equal parts, each called a degree, the zero-point being 32 degrees or divisions below the freezing of water. The freezing point is 32°, and the boiling point 212°. **Reaumur,** one in which the freezing-point is 0°, and the boiling-point 80°.

Comparison of Thermometers.—To convert the registration of one thermometer into that of another, the following formulas are useful:

Let F = number of degrees Fahrenheit.
Let C = number of degrees Centigrade.
Let R = number of degrees Reaumur.

Then:

$$C^\circ = \frac{5}{9}(F^\circ - 32) \qquad C^\circ = \frac{5}{4}R^\circ$$

$$F^\circ = \frac{9}{5}C^\circ + 32 \qquad F^\circ = \frac{9}{4}R^\circ + 32$$

$$R^\circ = \frac{4}{5}C^\circ \qquad R^\circ = \frac{4}{9}(F^\circ - 32)$$

The following is a comparative table:

FAHR.	CENT.	REAU.	FAHR.	CENT.	REAU.	FAHR.	CENT.	REAU.
212	100	80	122	50	40	32	0	0
210	98.9	79.1	120	48.9	39.1	30	−1.1	−0.9
208	97.8	78.2	118	47.8	38.2	28	−2.2	−1.8
206	96.7	77.3	116	46.7	37.3	26	−3.3	−2.7
204	95.6	76.4	114	45.6	36.4	24	−4.4	−3.6
202	94.4	75.6	112	44.4	35.6	22	−5.6	−4.4
200	93.3	74.7	110	43.3	34.7	20	−6.7	−5.3
198	92.2	73.8	108	42.2	33.8	18	−7.8	−6.2
196	91.1	72.9	106	41.1	32.9	16	−8.9	−7.1
194	90	72	104	40	32	14	−10	−8
192	88.9	71.1	102	38.9	31.1	12	−11.1	−8.9
190	87.8	70.2	100	37.8	30.2	10	−12.2	−9.8
188	86.7	69.3	98	36.7	29.3	8	−13.3	−10.7
186	85.6	68.4	96	35.6	28.4	6	−14.4	−11.6
184	84.4	67.6	94	34.4	27.6	4	−15.6	−12.4
182	83.3	66.7	92	33.3	26.7	2	−16.7	−13.3
180	82.2	65.8	90	32.2	25.8	0	−17.8	−14.2
178	81.1	64.9	88	31.1	24.9	−2	−18.9	−15.1
176	80	64	86	30	24	−4	−20	−16
174	78.9	63.1	84	28.9	23.1	−6	−21.1	−16.9
172	77.8	62.2	82	27.8	22.2	−8	−22.2	−17.8
170	76.7	61.3	80	26.7	21.3	−10	−23.3	−18.7
168	75.6	60.4	78	25.6	20.4	−12	−24.4	−19.0
166	74.4	59.6	76	24.4	19.6	−14	−25.6	−20.4
164	73.3	58.7	74	23.3	18.7	−16	−26.7	−21.3
162	72.2	57.8	72	22.2	17.8	−18	−27.8	−22.2
160	71.1	56.9	70	21.1	16.9	−20	−28.9	−23.1
158	70	56	68	20	15	−22	−30	−24
156	68.9	55.1	66	18.9	15.1	−24	−31.1	−24.9
154	67.8	54.2	64	17.8	14.2	−26	−32.2	−25.8
152	66.7	53.3	62	16.7	13.3	−28	−33.3	−26.7
150	65.6	52.4	60	15.6	12.4	−30	−34.4	−27.6
148	64.4	51.6	58	14.4	11.6	−32	−35.6	−28.4
146	63.3	50.7	56	13.3	10.7	−34	−36.7	−29.3
144	62.2	49.8	54	12.2	9.8	−36	−37.8	−30.2
142	61.1	48.9	52	11.1	8.9	−38	−38.9	−31.1
140	60	48	50	10	8	−40	−40	−32
138	58.9	47.1	48	8.9	7.1	−42	−41.1	−32.9
136	57.8	46.2	46	7.8	6.2	−44	−42.2	−33.8
134	56.7	45.3	44	6.7	5.3	−46	−43.3	−34.7
132	55.6	44.4	42	5.6	4.4	−48	−44.4	−35.6
130	54.4	43.6	40	4.4	3.6	−50	−45.6	−36.4
128	53.3	42.7	38	3.3	2.7	−52	−46.7	−37.3
126	52.2	41.8	36	2.2	1.8	−54	−47.8	−38.2
124	51.1	40.9	34	1.1	0.9	−56	−48.9	−39.1

The clinical thermometer is a small, maximum, self-registering, mercurial thermometer, used in obtaining the temperature of the body. In its usual form the range of scale is about 15° F., and graduation is carried to one-fifth of a degree. The bulb is of extremely small diameter and fine bore, in which the mercury is rendered visible by a lens-fronted stem. The best clinical thermometers register in 30 seconds, but to secure sufficient accuracy it is generally desirable to allow 5 minutes to elapse before removing the thermometer from the mouth or axilla. Especially in obscure cases is this desirable.

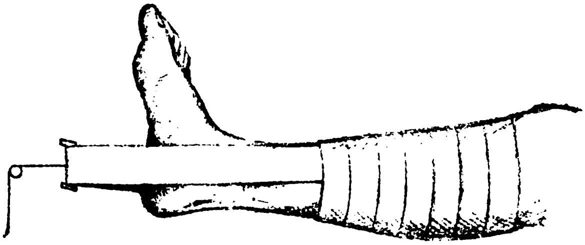
The axilla is the locality most suitable for thermometric observation. The mouth, the rectum, or even the vagina may be utilized. When inserted in the mouth, the thermometer should be placed under the tongue, and the lips should be tightly closed. Great care is to be exercised that the instrument does not slip too far into the rectum when rectal temperature is taken. The thermometer should be introduced 2 inches deep, or above the internal sphincter, the patient lying on the side, the thermometer being kept *in situ* by one hand, letting the other rest on the hip of the patient to arrest any turning movement which might be made. To remove the instrument, it may be gently pushed forward a little to bring the bulb in contact with a fresh part of the mucous membrane, a part that has not been cooled by the thermometer. A practical caution is that the thermometer should not be introduced into a mass of feces which may fill the rectum. The inguinal fold or the fold of skin between the thumb and second metacarpus may be used for special, but not for general, clinical purposes. The clinical thermometer should be washed after usage. See TEMPERATURE.

THIGENOL.—The trade name of a solution of sodium sulphite in a synthetic sulphuretted oil containing 10 percent of sulphur in organic combination. It occurs as a dark-brown, syrupy fluid, soluble in distilled water, alcohol, or glycerin. It is odorless and almost tasteless, and is used locally in eczema, seborrhea, acne rosacea, and other skin diseases. Dose, 3 to 10 grains.

THIGH, AMPUTATIONS.—In amputations through the shaft of the femur the mixed method (an anterior skin flap with a shorter posterior one by transfixion) answers so well that any other is seldom needed. Care must be taken not to slit or prick the artery as it is passing out of Hunter's canal, and in arranging the dressings it must be remembered that, owing to the rotation of the thigh, the flaps very soon assume a lateral position.

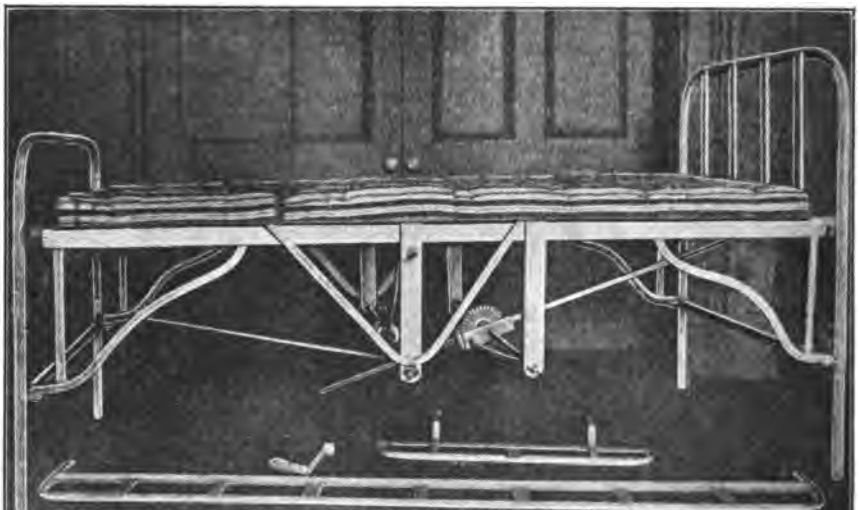
Amputation through the condyles may be performed according to either Carden's or Stokes' method. The section of the bone in the former runs through the base of the condyles, and the anterior flap passes across the limb midway between the apex of the patella and the tubercle of the tibia; in the latter the bone is divided above the condyles (supracondyloid), and the anterior flap reaches down to the tubercle, the increased length being required by the patella, the sawed surface of which is removed, so that it may face and become adherent to the cancellous tissue of the femur. They are both far superior to amputation through the thigh, owing to their enabling the pressure to be borne (in part, at least) on the face of the stump and their preserving the insertion of the adductor, and, in Stokes', the insertion of the extensor muscles. Gritti's amputation is similar to Stokes', but the bone is divided 1/2 inch lower, and the patella does not fit so well. In Carden's operation there is no posterior flap; in Stokes' the posterior flap is nearly as long as the anterior, and is cut either by dissection or transfixion, according to the bulk of the limb. See AMPUTATION.

THIGH, FRACTURES.—Fracture at the upper end of the femur is a frequent injury, and is of great practical importance. The neck of the femur is situated in large part within the joint capsule; hence, pure intracapsular fracture may occur. Fracture nearer the base of the neck may be entirely extracapsular, but, as a rule, the line of such a fracture is oblique to the long axis of the neck, and the fracture is partly extracapsular and partly intracapsular, or "mixed."



Mode of Applying Stirrup for Weight-Extension.

This fracture results generally from a fall upon the hip: (1) upon the trochanter, the fracture resulting generally being at the base of the neck (extracapsular), impaction not infrequently occurring into the trochanter; (2) upon the extended knee or leg, such fracture generally being intracapsular. Extensive rotatory movements may likewise cause fracture, through tension and traction of the iliofemoral ligament (fracture by traction). These fractures occur frequently in old persons—most frequently in old women. This is due to the fragility of the bones in advanced age, which is especially pronounced at the upper end of the femur. The bones become fragile earlier in women than in men; and, together with the sharper angle that the neck forms with the shaft in women, this fragility explains the more frequent occurrence of this fracture in women than in men.



Bed Used in Fracture of the Thigh.—(*Bullitt.*)

Impaction of the thin portion of the neck into the head (intracapsular fracture) or of the neck into the trochanter (extracapsular fracture) is likely to result if the force producing the fracture acts in the direction of the long axis of the neck. Such impaction prevents the occurrence of several of the physical signs of fracture (abnormal mobility, crepitation); and when it occurs, no effort should be made to disengage the fragments. Clinically, such impacted fractures resemble incomplete fractures of the neck of the femur.

The symptoms of fracture of the neck of the femur are sometimes very obscure, a positive diagnosis often being impossible. Fracture is probable when a person of advanced age is unable to walk after receiving a fall, and when the injured leg is rotated outward and is more or less shortened. In forward luxation of the femur the leg is fixed *elastically* in outward rotation, while in fracture of the neck the rotation can be readily overcome, but the limb immediately drops back outward on being released. In incomplete or impacted fracture this outward rotation is less marked.

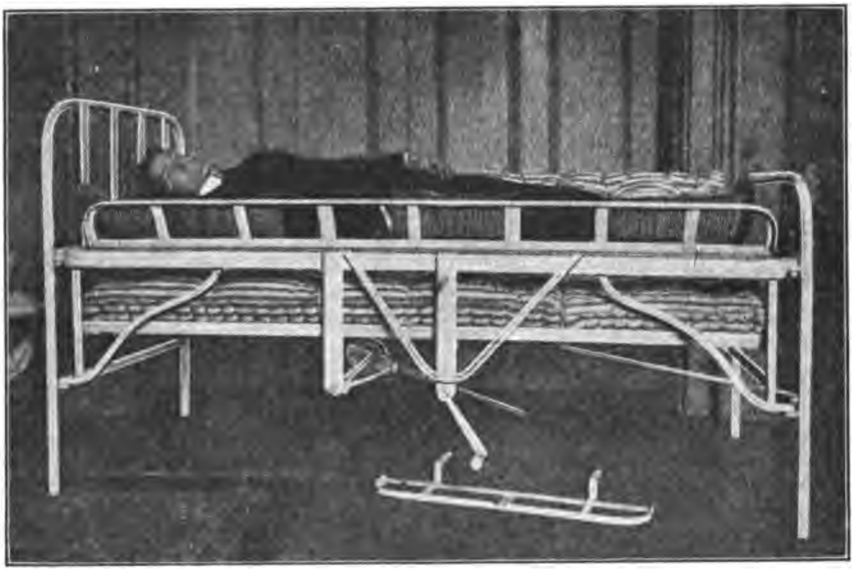
The higher position of the trochanter, determined by the comparative relationship to Nélaton's line, is a matter of great importance. If there is shortening of the injured side, measuring from the anterior superior spine of the ilium to the knee, and if the distance from the tip of the trochanter to the knee is the same on both sides, manifestly the seat of the shortening must be in the neck of the femur.

It may happen that no fracture is sustained at the time of the fall, only a severe contusion, which, however, markedly interferes with the nutrition of the head of the femur and of the contiguous portion of the neck; the result of this may be a complete breaking down of the bone structure, and the appearance of a fracture secondarily. This occurrence is rare, but does undoubtedly take place. Movements of the injured thigh, are usually possible in all directions, are painful, and elicit crepitation when the fragments are loose and remain in contact. In rotating the thigh the shaft of the femur turns about its long axis in extracapsular fracture, while in intracapsular it turns about a radius equal in length to the intact portion of the neck of the femur. The X-rays should be employed in all these cases and will remove all possible doubt as to the character and extent of the injury.

Treatment.—These patients are generally old, and therefore treatment is complicated by the necessity of preserving and improving general health and nutrition, and of guarding against the occurrence of an asthenic hypostatic pneumonia, which may easily prove fatal. Frequent change of position is indicated—sitting up, turning from side to side, deep breathing, and, finally, early walking with the aid of ambulatory splints. This last is most readily accomplished by means of a spica of plaster of Paris; the sole of the shoe on the sound side is raised, and then a pair of crutches permit locomotion without disturbing the injured hip. In intracapsular fracture the fragment composed of the head is so poorly nourished that bony union is exceptional, fibrous union the rule. In extracapsular fracture callus-formation is likely to be abundant, and so bony union is the rule.

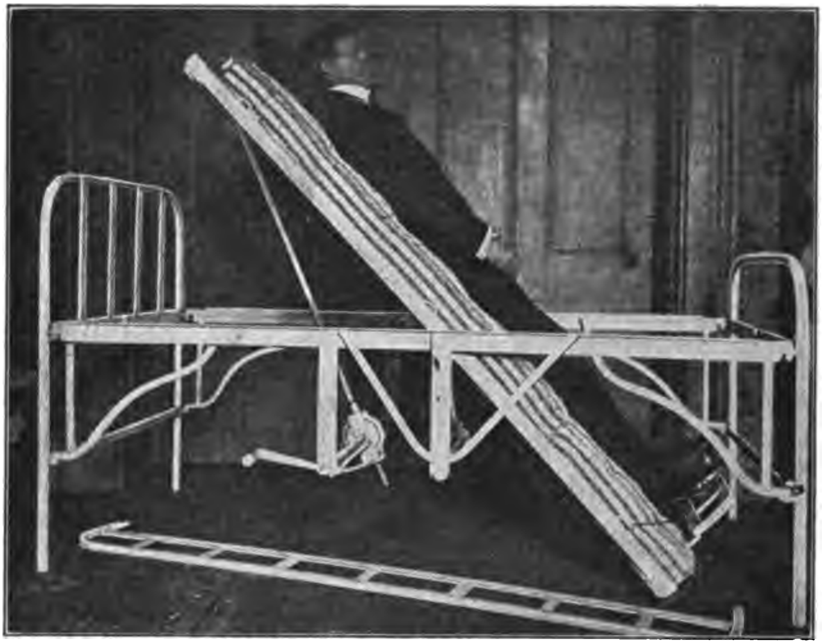
In impacted fracture, or in loose fracture without tendency to displacement and outward rotation, the indicated and necessary rest is readily attained by means of sand-bags placed along the inner and outer sides of the limb. Comfort or necessity may demand the addition of a Buck's extension apparatus (adhesive-plaster straps, weight, and pulley). In the ordinary loose fracture, with displacement, reposition must first be carefully effected; then a Buck's extension apparatus applied, the foot preferably being held fast and controlled by means of a sliding foot-rest to which the foot is made fast, thus preventing the tendency to outward rotation. A weight of from 10 to 15 pounds ordinarily serves to maintain the fragments in good position. This weight and pulley method is especially admirable in that it permits mobility of the limb and the assumption of a semirecumbent attitude, without injury or pain.

Plaster-of-Paris and hip splints of leather are applicable only when the patient is able to leave the bed, intermittingly at least. The majority of these patients are old and feeble, so a brilliant final result is seldom to be expected; most of them do very well if they learn to walk again with a limp and a cane after the expiration of 6, 8, or more weeks.



The Bed Tilted Laterally.

The serious difficulty in the treatment of these cases is the maintenance of rest of the injured hip in good position, at the same time providing for frequent shifting of the patient's position, combating the hypostatic tendency. The hip must, therefore, frequently be sacrificed to the patient's life. The accompanying illustrations show a bed designed by Bullitt for meeting this very difficulty. The bed is so arranged that the whole bed plane can be tipped from side to side, and the head can be raised to an almost upright position without any movement on the part of the patient. The utility of this contrivance in the handling of such cases is obvious, and practical use has demonstrated its great value. The working and uses of the bed are illustrated by the cuts made from photographs. The first cut shows the bed for use as an ordinary bed. The second cut shows the bed plane tilted laterally, thereby shifting the weight from the back to the side. Small, firm, hair pillows are packed in between the patient and the side bar, and so the patient does not move or slip while the change in position is being effected. The third cut shows the bed-frame tilted lengthwise; this position is especially designed for the treatment of fractures of the thigh and hip in old persons. The foot of the sound side is supported by two small and firm, hair pillows inserted between it and the foot-board, so permitting the foot of the injured side to swing free. Elevation can be accomplished to almost an upright position, though such a degree of elevation would probably seldom be employed.



The Bed Tilted Lengthwise.

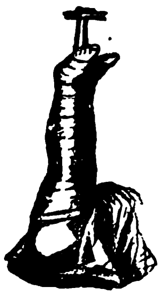
The great trochanter is rarely separated as a result of direct force. When separation occurs, it is recognizable through the displacement, the fragment being felt behind and above the glutei muscles, with a wide diastasis between it and the femur. The muscular traction makes it difficult to hold the fragment in place by dressings. In case of failure, it only remains to fix the fragment in place directly by means of suture or nails. In any event, the thigh should be kept in abduction.

Fractures of the diaphysis of the femur in its middle third, or just above the middle, are frequent. Some are due to torsional force, but the greater number to bending by direct force (run-over accidents). In this locality displacement is generally considerable in the adult; in children the relatively thick periosteum remaining intact usually prevents marked displacement. The fracture line is generally oblique, and longitudinal traction of the powerful thigh-muscles easily effects displacement, which is sometimes extreme. Abnormal mobility is readily demonstrated; likewise crepitation. If crepitation cannot be demonstrated, especially after reposition, it is presumable that soft parts are interposed between the fragments; correct and bony union cannot be expected unless the fragments are brought into good apposition.

A typical displacement accompanies fractures above the middle of the shaft. The upper fragment is carried into flexion by the iliopsoas muscle, and into abduction by the glutei muscles; at the same time the lower fragment is drawn upward and inward by the hamstrings and the adductors. This projection of the upper fragment forward and outward is to be carefully borne in mind when effecting reposition and fixation; otherwise the deformity will be found persisting after the consolidation of the fracture.

Treatment.—In the treatment of fractures of the diaphysis permanent extension, by means of adhesive-plaster straps, weight and pulley (Buck's extension apparatus), is of the very greatest usefulness, and tends to greatly simplify treatment. The adhesive-plaster straps are to have broad surfaces, and should be capable of supporting a weight of from 20 to 25 pounds, which is necessary to overcome the upward muscular traction. Pillows and sand-bags sometimes suffice to support and further control the position of the limb; usually, however, it will be found best to support the fragments by means of short splints padded and securely bound to the thigh over the extension apparatus. The addition of a sliding footboard is sometimes necessary properly to control the rotatory tendency of the lower leg. In fracture with a short upper fragment the displacement already referred to (forward and outward) is difficult to combat. Here the double inclined plane of Agnew is of good service, together with an extension apparatus acting on the thigh from the knee upward and making traction in the direction of the displacement of the upper fragment forward and outward. Perhaps the best support of all is by means of molded leather splints in combination with Buck's extension apparatus. The splint is cut from saddle skirting leather and is made of a shape to extend from the knee well up over the hip and to cover the anterior and outer aspects of the limb. The leather is immersed in hot water (hot as the hand can bear), and is then molded to the part, being held in place for a few minutes by means of a roller bandage. It is then removed and dried before the fire for a short time, when it will retain its shape. The extension apparatus is now applied, reposition is effected, and the leather splint is securely bound to the limb. It is necessary from time to time to measure the two thighs from the anterior superior spine to the patella, guarding in this way against the occurrence of any excessive shortening.

Ordinarily, at the end of 4 weeks consolidation is far enough advanced to change the dressing to one of plaster of Paris, which permits locomotion and is worn for 4 weeks more.



Bryant's Vertical Extension for Fracture of Femur in Children.

In children the method of **vertical suspension** of the whole limb (or better, of both limbs) is a most excellent one. Vertical suspension is also applicable in adults when it is found otherwise impossible to preserve the proper position of the fragments.

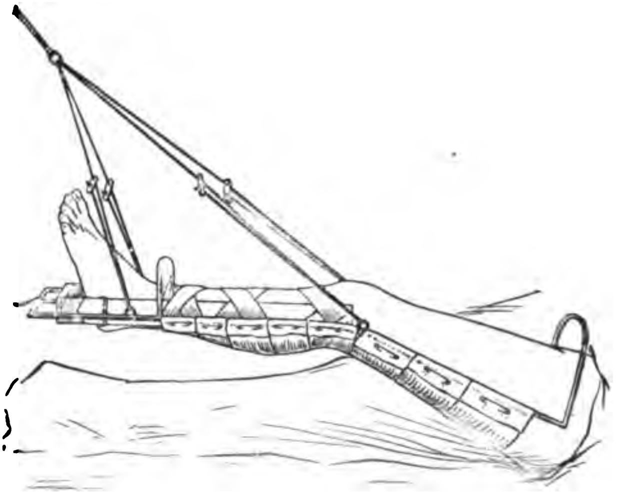
In new-born children almost the only possible way to fix the thigh is in the position of the fetus *in utero*, with the thigh flexed against the abdomen and held there by means of adhesive-plaster straps. This dressing permits the ready handling and cleansing of the child.

Every fracture of the thigh is likely to be attended by greater or less permanent shortening of the limb.

Compound fractures, which require frequent change of dressings, are very conveniently treated by means of the suspending splint of Hodgen.

Fractures at the lower end of the femur are rarer than those of the shaft and neck, and result from direct violence.

In supracondylar transverse fracture the lower fragment is drawn downward in flexion by the calf-muscles, while the traction of the thigh-muscles tends to increase the overriding of the fragments and the marked displacement. In epiphyseal separation similar displacement occurs, although slighter in degree, because the periosteal covering remains intact, in part, at least. The knee-joint may be involved, and certainly is if the lower fragment becomes split longitudinally—T-fracture. The vessels and the sciatic nerve are in danger of injury from the sharp edges of the displaced lower fragment. Abnormal mobility and crepitation readily determine the nature of the injury. After requisition it is manifest that the mechanically correct position is one of flexion, more or less acute, whereby the tendency of the lower fragment to recurrent displacement is best overcome. This may be accomplished by a posterior angular splint or by the double inclined plane. Sometimes permanent extension is suitable, together with gentle pressure from behind against the lower fragment. After 4 or 5 weeks passive motion should be instituted, and further treatment, as for articular fracture elsewhere, should be given.



Hodgen's Suspension Splint.—(*Moullin.*)

Fracture of one condyle is necessarily intra-articular, and is recognizable by the to-and-fro movements at the knee, by crepitation and by the localized pain. Hemorrhage into the joint may be profuse, and if so, the blood should be evacuated by aspiration. An extension dressing with a posterior splint is best, or a double inclined plane may be used. Care must be taken to counteract any varus or valgus tendency that may become manifest.

THIOCOL.—The potassium salt of guaiacol sulphonic acid. It contains about 60 percent of guaiacol, and is in the form of a fine, white powder, which has a taste at first bitter, then sweetish. It is used in diarrhea, pneumonia, and all forms of tuberculosis. As advantages over other remedies may be mentioned: Entire freedom from odor, great solubility in water, ready absorption, and freedom from irritant action on the mucous membranes. It is claimed that these properties make it applicable for the most sensitive patients.

Dose is from 7 to 30 grains, up to 1 1/2 drams or even 4 drams daily. Daily doses of from 150 to 225 grains may be continued for a considerable time without disadvantage, which is of the greatest importance in the creosote treatment. It causes no nausea or diarrhea.

THIOL.—Prepared by the sulphuration of certain nonsaturated hydrocarbons, and is a product very similar to ichthyol. It occurs in both dry and liquid form, the former, *Thiolum siccum*, as dark-brown lamellæ or powder, of bituminous odor and bitter, astringent taste; soluble in water and in chloroform, sparingly in alcohol, insoluble in ether and in benzin. The liquid form, *Thiolum liquidum*, is a dark-colored, syrupy fluid, miscible in all proportions with water. Dose, internally, 5 to 30 grains.

The dry form is used as a dusting powder in erysipelas, eczema, erythema, intertrigo, impetigo, pemphigus, periphlebitis, subcutaneous hemorrhages, and syphilitic ulcers. It is an efficient application in pelvic exudations and endometritis. Thiol causes neither pain, burning, nor other symptoms of irritation, nor any bleeding from eroded surfaces.

Glycerinated thiol is a remedy for chilblains, consisting of equal parts of liquid thiol and glycerin.

THIOSINAMIN.—Allyl-sulpho-carbamid. It is prepared by heating together oil of mustard 3, alcohol 3, and ammonia 6. It occurs as colorless crystals, which are very soluble in alcohol and in ether, and moderately so in water. The addition of antipyrin in one-half the quantity renders it soluble in water to the extent of 15 percent (Michel). It produces a local reaction when injected for lupus, or where sclerotic tissue is present, which it softens and permits of its absorption. It is used for the removal of scars, corneal opacities, and keloid; also for lupus, fibrous deposits in joints, stenosis of the esophagus, and for deafness due to thickening of the drum or fixation of the aural bones. Dose, 1/2 to 1 grain, thrice daily by mouth; or 10 to 20 minims of a 10 percent solution in absolute alcohol, hypodermically every third day. The ethyl-iodid of thiosinamin is said to be of service in arteriosclerosis, asthma, emphysema, scrofula and syphilis, given internally in doses of 2 grains several times a day.

THIRST.—The state manifested by a desire for drink. It is marked by dryness of the mouth and fauces, together with constriction of the pharynx and esophagus.

Although referred to the back of the throat, thirst is not a purely local feeling, since it cannot be allayed until fluid reaches the stomach and is absorbed. In febrile disorders, after hemorrhage or operation, in cholera and diarrhea, in diabetes mellitus, and in acute and chronic gastritis thirst is usually present. It forms a useful diagnostic sign between chronic gastritis and mere atonic dyspepsia.

Remedies that allay thirst and impart coolness, such as the vegetable and mineral acids, ice, water, if cold, effervescing drinks, fruit-juices, and many diaphoretics are called refrigerants. Acid drinks allay thirst by promoting the secretion of alkaline saliva, but when excessively used, they will derange the stomach. Cracked ice, sucked, is very grateful, and allays thirst in fever. Fruit-juices, or those made into drinks, must be used in moderation: excess will do harm. Bitters, in drinks with acids, most effectually slake the thirst. A weak infusion of orange-peel acidulated with hydrochloric acid makes an efficient thirst-queller in fever patients. Tepid drinks are useful in the thirst of diabetes.

THOMSEN'S DISEASE.—See MYOTONIA CONGENITA.

THORACIC DUCT, AFFECTIONS. Diseases.—Narrowing may result from inflammation of the coats or blocking of the lumen by pressure of an aneurysm, tumor, or contracting cicatrices, or from cancerous or tubercular material. Complete obliteration need not cause death or even marked symptoms, since the veins seem to act vicariously. Aneurysm of the duct and dilatation and calcification of the walls have also taken place. A primary growth in the duct has not been recorded.

Injuries.—The thoracic duct has occasionally been torn or wounded. In such cases a discharge of a spontaneously coagulating fluid, milky during digestion, has taken place. In one instance the fluid escaped into the pleural cavity, which had to be tapped repeatedly. A diagnosis of injury to this duct is impossible save by evidence of this chylous fluid escaping or being tapped from the pleural cavity. The prognosis is of the utmost gravity, as death is the general rule, in weeks rather than months, and from marasmus. In one case the opening in the duct was said to have healed under a plug. In another case a clamp was made use of, and packing of the cavity around this with gauze resulted in recovery. See CHEST (Injuries).

THORACOPLASTY.—See PLEURISY (Treatment).

THORAX.—See CHEST.

THREAD-WORMS.—See WORMS.

THROAT.—See ESOPHAGUS, LARYNX, NECK, PHARYNX.

THRUSH.—See STOMATITIS (Parasitic).

THUMB.—See HAND AND FINGERS.

THYME.—A plant of the genus *Thymus*.

Oil of Thyme is a stimulant and antiseptic oil containing thymol; chiefly used topically in veterinary practice.

THYMOL.—$C_{10}H_{13}HO$. A phenol with active antiseptic and anesthetic properties. It exists in oil of thyme and other vegetable oils. It occurs in large, colorless plates, melting at 44° C. and boiling at 230° C. It has a thyme-like odor, and is slightly soluble in water but readily soluble in alcohol. Thymol is chiefly employed as a gargle, spray or inhalation in laryngitis and diphtheria; as an ointment in ringworm, eczema and psoriasis, and as an injection in ozena. A solution of 1 part in 1000 is the strength usually prescribed. Internally it has been used with success in diphtheria, typhoid fever and other intestinal affections, diabetes, phthisis and vesical catarrh. Its fragrant odor renders it a very agreeable antiseptic application for ulcerated conditions of the mouth and fauces, but makes it very attractive to flies, which fact together with its high price will prevent it becoming a favorite in hospital practice. A solution, used as a mouth-wash, is very efficient in removing the odor of tobacco from the breath. Thymol is almost specific against the intestinal parasite ankylostomum duodenale (*uncinaria Americana*) for which it is given in three or four doses of 10 to 30 grains, well triturated, in capsules; care being taken that no alcoholic drink is ingested afterward, in order to avoid the absorption of thymol and consequent poisoning thereby. Dose, 1/2 to 3 grains. **T. Inhalation,** thymol, 20 grains; alcohol, 3 drams; magnesium carbonate, 10 grains; water; add enough to make 3 ounces; add a teaspoonful to a pint of water at 150° F. for each inhalation. **T. Iodid,** See ARISTOL. **T. Solution,** for spraying, 1: 1000. **T., Ung.,** contains 5 to 30 grains to 1 ounce. **Volkmann's Thymol Solution,** thymol 1, alcohol 10, glycerin 20; and water 100. It is used as a spray and antiseptic lotion; it does not produce eczema, as do phenol lotions.

THYMUS GLAND.—See STATUS LYMPHATICUS, NECK (Injuries).

THYMUS GLAND EXTRACT.—An animal extract whose mode of preparation and dose are similar to those of thyroid extract. It has been serviceable in exophthalmos with anemia and debility, in leukemia, chlorosis, idiopathic and pernicious anemia, and in the so-called "status thymicus."

THYRESOL.—The methyl ether of santalol. It is similar to sandal wood oil in its properties but is said not to produce gastric or renal irritation. It is recommended in the treatment of gonorrhea, etc. Dose, 8 grains in milk or in gelatin capsules.

THYROID EXTRACT.—See THYROID TREATMENT.

THYROID GLAND, DISEASES.—Colloid degeneration, affecting the contents of the sacs and attended with atrophy of the cellular lining, is of so common occurrence as almost to be considered normal. Nothing is known with regard to its function beyond the general fact that the activity of growth and nutrition of all parts of the body (including the brain) are intimately connected with its integrity. In women it frequently enlarges and becomes tender—at puberty, during the menstrual period, and during pregnancy. Cretinism is, in all probability, due to its imperfect development; removal during childhood causes a similar condition, and, in a large proportion of cases, removal of the whole gland is followed by myxedema, if performed on adults. The temperature falls; the oxygenating capacity of the blood diminishes; leukocytosis sets in; the coagulability is lessened; the skin and subcutaneous tissue undergo a peculiar transformation; nervous symptoms (tremors, paresis, paresthesia, etc.) make their appearance, and, at length, a cretinoid condition, with imbecility and coma, follows. When this does not take place, it is probably owing to the fact that the whole gland has not been removed, or that accessory thyroids (which are of very common occurrence) have undergone compensative hypertrophy. Sometimes it follows with great rapidity shortly after the operation; sometimes, on the other hand, slowly and gradually. In a few instances the immediate onset, after a period of apparently perfect health, has been brought on by exposure to cold (Moullin).

Inflammation may be acute or chronic, and in resolution or in suppuration and sloughing, according to the cause and the addition or not of pyogenic irritants.

The symptoms, when the attack is acute, are very alarming, often beginning with a rigor and high fever. Owing to the way in which the gland is bound down by the cervical fascia the pain is very severe; the tissues of the neck are hard and rigid, the superficial veins distended, the trachea and esophagus compressed against the spine, and there may be cerebral symptoms caused by the obstruction to the cranial circulation. In most cases resolution sets in after 48 hours, and the acute symptoms begin to subside, but often the improvement is only partial; the diffuse enlargement disappears, but one or more local swellings remain; the skin becomes red and edematous, and at length fluctuation is apparent. Death may occur from pressure upon the trachea, from pus finding its way down into the lungs, or from pyemia or septicemia. In one or two instances the gland has sloughed.

The treatment must be energetic. At the onset aconite or antimony may be given internally in small, frequently repeated doses, until a distinct effect is produced upon the arterial tension. Ice-cold compresses should be placed upon the neck, the superficial veins pricked to relieve the circulation, and leeches applied to the supraclavicular region. Venesection (either from the arm or the external jugular) may be advisable, if the patient is young and the inflammation sthenic. If signs of suppuration make their appearance, the superficial structures must be carefully divided, layer by layer, and a director used for exploration, after Hilton's method. A drainage-tube must be inserted to prevent the opening becoming valvular.

Goiter, or **Derbyshire neck,** is an enlargement of the thyroid gland. It may be due, as is commonly the case, to simple hypertrophy of the normal tissues of the organ (*ordinary goiter*), and may then involve the whole gland or one of the lateral lobes or rarely only the isthmus. In other instances the hypertrophy may fall chiefly on the fibrous tissue, constituting the septa of the gland (*fibrous goiter*). Or along with some amount of simple hypertrophy and increase of fibrous tissue (*adenoma*) one or more of the normal alveolar spaces may becomes enlarged, forming single or multiple cysts (*cystic goiter*). Such cysts contain, when single, a serous fluid, or when multiple, a colloid or a dark, grumous material sometimes mixed with altered blood; while occasionally, proliferating growths project into their interior from the cyst walls. In other instances again, but more rarely, the hypertrophy is associated with a great increase in the vessels, and a forcible and expansile pulsation is given to the gland (*pulsating goiter*). But the tissues, besides hypertrophy, may undergo secondary changes. Thus, calcification may occur, and the enlarged gland become of stony hardness (*calcified goiter*) in places, or the fluid normally contained in the alveolar cavities may assume a colloid character. Lastly, the enlargement of the thyroid may be due to malignant disease (*malignant goiter*). In certain districts goiter is endemic, especially in the Rhone Valley in Switzerland, and in Derbyshire in England, and is then frequently associated with the condition known as cretinism. It also occurs sporadically; and in some cases again is accompanied by a peculiar jerking beat in the carotids, by anemia, and by a prominence of the eyeballs. See EXOPHTHALMIC GOITER.

The symptom common to any form of enlargement of the thyroid is a swelling taking more or less the characteristic shape of the thyroid gland, and *moving with the larynx in deglutition*. In this country the enlargement is generally moderate; but sometimes, and especially in Switzerland, the goiter forms a large mass hanging in front of the neck, and may press upon or even displace the trachea and esophagus. It occurs chiefly in women. In the ordinary variety it is soft, semi-fluctuating, and of uniform consistency; in the cystic one or more fluctuating places may be felt; while in the fibrous it will be firm and hard and more or less lobed or irregular, and when calcification has taken place, of stony hardness. Malignant goiter, which is very rare, may be known by rapid growth, enlarged glands, and the other signs of malignancy.

The cause of endemic goiter is not known. It has been attributed to impure water, water from limestone, and snow water, but without conclusive evidence. It is said to be most prevalent in valleys where, from their direction, the sun does not penetrate, on damp soil, and in damp parts of towns; but, according to Berry, these influences have little or nothing to do with its causation. In sporadic cases heredity, disturbance of the sexual functions, and conditions producing congestion of the head and neck are given as causes.

Treatment.—Sporadic cases of ordinary goiter should be treated by the internal and external application of iodin, and removal from the goitrous district. Thus the syrup of the iodid of iron may be given internally, and an ointment of iodin and iodid of potassium applied externally. The use of biniodid of mercury ointment, followed by exposure to a hot sun, has been attended with much success in India. An ice collar has sometimes been of service.

Cystic goiter may be treated by aspiration, drainage or enucleation. Of these the first is of little avail, except as a temporary expedient in an urgent case, or as a preliminary to other measures. The fluid must be drawn off very slowly, or hemorrhage may occur from the delicate vessels in the walls of the sac, and fill it even more tensely than it was before.

Drainage and enucleation are more successful. A linear incision is made through the superficial structures, and the capsule of the gland freely exposed. If there is a large single cyst, it can usually be enucleated by careful dissection, clamping and dividing between two ligatures every vessel; solid adenoma may be treated in the same way. If this is impraticable, the cavity may be laid open and the contents cleaned out; but the operator must be prepared for severe hemorrhage. Plugging with iodoform gauze may be necessary if it does not stop at once. It does not appear to be necessary to fasten the edge of the cyst to the skin or the cervical fascia; according to Clutton, if the superficial structures are not disturbed or displaced, there is very little risk of inflammatory infiltration. If a number of small cysts are packed closely together, it is better to excise the part so long as it is not too large, ligating the vessels one by one as they appear, and taking especial care of the recurrent laryngeal nerve.

Operative treatment consists in ligation of the thyroid arteries; division of the isthmus; removal of the isthmus or one lobe; or partial removal of both lobes.

In beginning goiter ligation of the superior thyroid arteries has sometimes arrested the process of morbid growth. Division of the isthmus is a palliative operation for late cases in which the trachea is compressed.

It may be stated as a general rule that every rapidly growing goiter should be removed. Timely recourse to operation will save the patient much trouble. Partial excision of the thyroid is the operation of choice. It is performed as follows: As little anesthetic as possible, and that chloroform or ether by the open method, should be given since dyspnea is liable to occur during the operation. On this account some surgeons employ local anesthesia with cocain. An incision is made over the tumor along the anterior border of the sternomastoid when part only of one lobe is to be removed. If a part of both sides, then a curved incision across the front, so that the scar may be covered by a necklace. Then the sternomastoid is retracted, and the sternohyoid, sternothyroid split, or, along with the omohyoid, cut across, but as far from the line of the cutaneous wound as possible to prevent their adherence to the scar, which would then be puckered in every time the muscles contract. The tumor having been thus exposed, the fascia should be opened carefully so as not to injure the veins lying beneath it. When necessary, the veins are divided between clamp forceps, and later tied. Enucleation should now be begun with the finger, aided by a small sponge held in clamp forceps, bearing in mind that although the common carotid artery is pushed outward, the internal jugular vein usually runs over the tumor, being held more or less in position by the veins opening into it. The pulsation of the artery is therefore no guide to the position of the vein, which may run in front of, or internal to the artery.

The superior thyroid arteries should be sought at the upper and inner part of the tumor and securely tied. Of the lower part of each lateral lobe a piece should be left, at least as large as the end of the thumb. In this way one may avoid injuring the recurrent laryngeal nerve which passes upward among the main divisions of the inferior thyroid artery. When the tumor has plunged behind the sternum, delicate manipulation is needed to isolate it from the pleura and innominate veins. After applying ligatures, the capsule may be drawn together by a purse-string suture, next the divided muscles should be sutured together if possible, and the skin united except for a small drain.

Sarcoma or carcinoma arising in the thyroid gland, if it is to be removed must be diagnosed early. A tumor arising in the thyroid gland, in a patient over forty, especially in a man, and a gumma being excluded, should at once be explored, and removed early, while still within the capsule of the gland.

THYROID GLAND, INJURIES.—See NECK (Injuries).

THYROID TREATMENT.—The treatment of disease by the administration of thyroid gland or substances derived from it.

Preparations.—(1) The fresh gland of the sheep, minced. (2) The thyroid glands of the sheep, freed from fat, and cleansed, dried and powdered (the desiccated thyroid glands of the U. S. P.). (3) Dry thyroid (thyroideum siccum of the British Pharmacopeia). This is prepared by removing the fat and connective tissue from the healthy gland taken from the sheep directly after it is killed. The gland is minced, dried at from 90° to 100° F., and powdered. Fat is removed by washing with petroleum spirit, and the powder dried. (4) Glycerin extract of thyroid (liquor thyroid of the British Pharmacopeia). The fresh, healthy thyroid glands of the sheep are bruised with 34 minims of glycerin and 34 minims of a 0.5 percent solution of phenol for each gland. The mixture is allowed to stand for 24 hours, strained, and sufficient of the phenol solution added to make 100 minims. (5) Iodothyrin. This is obtained by hydrolysis of the colloid matter of the gland with diluted caustic soda, and precipitation of the colloid by acetic acid.

Dosage.—Of the raw gland, from 1/2 to 1 may be used. The dose of the U. S. P. preparation is 4 grains. Three to 10 grains of dry thyroid and from 15 to 60 minims of the glycerin extract may be given twice or thrice daily. Iodothyrin, as found in the shops, is rubbed up with sugar of milk and is administered in 5-grain doses.

Method of Administration.—The transplantation of thyroid glands (*greffe thyroidienne*) as practised by Bettencourt and Serrano has been abandoned. The ingestion of minced, raw, or slightly warmed sheep's thyroids, even when seasoned, so speedily provoke nausea and vomiting that this method is impracticable for prolonged use. The dry powdered gland can be given as such or in capsule, wafer, or tablets by the mouth. The glycerin extract is most frequently employed when given by the mouth, or when sufficiently diluted, hypodermically. Iodothyrin may be exhibited in substance, in capsule, wafer, or tablet, by the mouth or subcutaneously. The frequency varies from 2 to 3 times daily until the physiologic effects are obtained, then once daily or less frequently as may be necessary to maintain them.

Physiologic Action.—The result of the administration of thyroid is to increase oxidation in the body, the nitrogenous substances being excreted entirely as urea, fats as carbon dioxid by the lungs and as water by the kidneys. Diuresis is a constant effect, and this is greater than can be accounted for by increased oxidation, so that it is evident that the tissues themselves are desiccated. It is probable that the circulating proteids are first destroyed, while the fixed proteids are only attacked after the store of fat is considerably diminished. It is likely, considering the small quantity of thyroid administered, that these effects are brought about through the influence of the nervous system rather than by its direct action upon the tissues themselves. Since glycosuria is often a result of thyroid medication, it is likely that this substance may effect carbohydrate metabolism, so as to diminish the power of the tissues to utilize sugar (Hutchison). Increased rapidity of the heart's action is very constant, and often there are observed irregularity, palpitation, and even weakness; the fall of blood-pressure is probably due to the last-named condition rather than to dilatation of peripheral blood-vessels. As to its effects upon the blood, contradictory results have been observed. Probably small doses exert no influence, while large doses destroy blood-corpuscles. Making use of the colloid material, it may be said that excretion is entirely by the kidneys. This excretion is gradual, and may be continued for several days after its administration is stopped. Whether this material is excreted as such or is broken down in the organism is still an open question.

Some differences are observed in the results of administration of different preparations. The most important are that iodothyrin seems to have no effect upon the heart as to its rate, rhythm, or vigor; and this is true of the intravenous injections of colloid matter. The fall of pressure on administration of the gland or improperly prepared dry extracts is undoubtedly due to contained organic extractions, and it can be definitely stated that absolutely fresh thyroid gland is not poisonous when absorbed by way of the alimentary canal. Iodin is readily detected in the urine of patients who are taking iodothyrin, while it is found with difficulty after administration of thyroid preparations. The explanation doubtless is that normal thyroid stores up iodin and prevents its excretion. Inasmuch as there is no satisfactory method of standardizing thyroid preparations, the dose must, for the present, be determined from the results rather than the physician be guided by the posology as found in the literature.

Precautions in Administration.—Under the term "thyroidism" have been described symptoms that may be divided into 2 groups: (1) the alimentary—nausea, colicky pains, and diarrhea; (2) the metabolic—headache, pains and heaviness in the limbs, palpitation, disturbances of cardiac rhythm, and weakness. The first group may be due to products of putrefaction, to which the thyroid is especially liable, particularly if fever, sweating, and collapse are prominent. These can be avoided if the method of d'Arsonval (sterilization in an autoclave by carbon dioxid, under a pressure of 50 atmospheres) is employed. The second group is probably the result of overaction of the substance itself, since idosyncrasy must always be taken into consideration. Symptoms may appear after the use of any preparation, and are the results of increased metabolism. The practical suggestion to be borne in mind is that small and frequent doses—instead of large ones at longer intervals—should be employed. Caution and good sense should be shown in the use of thyroid preparations, and they should always be administered by a physician. The result after thyroidectomy in the practice of surgeons, demonstrates the necessity of strict observance of this rule. As improvement is secured the interval between doses should be lengthened, until constant physiologic effects only are secured.

Therapeutic Applications.—In the treatment of **myxedema** the use of the various preparations of the thyroid gland approaches nearer to specific action than any other in therapeutics, the results of mercury and the iodids in syphilis not even excepted. Inasmuch as in this disease the something that through cessation of function of the thyroid is not supplied to the organism can be furnished by the administration of preparations of this gland, the cure of myxedema becomes an assured fact. This statement is accurate only in the understanding that continued administration is persisted in. The tangible results observed are: (1) Lessening of the physical and intellectual torpor; (2) increased urinary excretion; (3) restoration of body temperature to the normal; (4) reabsorption of the edema of face and limbs. (5) progressive disappearance of difficulty of speech, interference with swallowing and muscular movements; (6) cessation of constipation; (7) diminution of body weight; (8) cessation of trophic disturbances—as, for instance, falling of the hair. In other words, the nutrition is stimulated and the principal functions are regulated.

The treatment may be divided into 2 stages: (1) curative and (2) prophylactic. In the first, daily doses should be persisted in until all symptoms have disappeared. If a preparation free from decomposition products is employed—and none other should be used—the amount given should be that which does not affect the pulse or produce other untoward action. So soon as cure has been obtained, the remedy should be given at intervals of one week or less, in such amount that no symptoms reappear. A fall of temperature or an appearance of slight edema should warn the physician that the dose is too small, the interval too long, or both dose and interval should be changed. If the dry extract is employed, the source of the powder should be known as well as its strength. Six to 15 grains may represent one thyroid gland, depending upon the manufacturer; tablets are unreliable, since they may not dissolve; capsules are uncertain on account of the varying solubility of the gelatin, and on no account should the powder be previously made into a mass. As a rule, the powder should be used as such, and in about double the dose by mouth as when injected subcutaneously. The glycerin extract is more useful; but of each specimen the dose must be determined clinically, since accurate standardization is, at present, impossible.

Cretinism or Infantile Myxedema.—The same rules apply and the same results are obtained—the dose being somewhat larger than reached by Young's rule and determined by experiment. Here the increase of height is notable, and the development of the intellectual processes is a fairly accurate index of the success of the treatment. In children the difficulties are fewer and the dangers less, for toxic symptoms are but rarely observed.

The treatment of postoperative myxedema (after total extirpation of the thyroid) yields brilliant results when used as a prophylactic. In comparison with the small number of patients observed, the instances of toxic symptoms have been considerable in number. These are entirely unnecessary and would never be seen were the treatment always intrusted to a careful physician. The smallest dose at the longest interval which will keep the patient free from symptoms of the disease should be chosen. Hard and fast rules cannot be formulated; each patient should be studied.

Obesity.—Next to the three conditions just enumerated, obesity affords the best example of therapeutic efficiency. Since the increased nitrogen elimination is due to the breaking down of the circulating proteids and the fixed are not attacked until the store of fat is considerably reduced, the diet should not be much restricted, and nitrogenous matter ought to be well represented. In these cases more than ordinary care must be exercised, because the heart may have undergone fatty changes. Since heredity and habits of life have much to do with obesity, the results of thyroid administration are not always satisfactory. It is claimed that iodothyrin is more efficient in anemic obese persons than in vigorous subjects.

The insanity of myxedema (acute or chronic mania, melancholia, or dementia) is amenable to treatment, because the disease itself can be cured. The insanities from other causes do not present constant results. In the chronic varieties the improvement in nutrition is likely to benefit the mental condition. In acute mania, by increasing tissue metabolism, the danger of exhaustion is heightened. The dangers as to the heart, gastric irritation, and muscular weakness must be borne in mind. Experience only can determine, outside of the exceptions noted, whether a particular patient will be likely to receive benefit.

The results in **exophthalmic goiter** have been various. From the literature as well as from personal experience no final conclusions can be reached. Since, as Gley very properly observes, the majority of the symptoms in many patients can be as plausibly explained by the hypothesis of partially deficient thyroid activity as by the hypothesis of augmentation of thyroid function, those who accept the first view are justified in making use of this remedy. Beyond the fact that it may increase the tachycardia and dangerously depress the heart, there is no objection to a trial being made—although good authority holds it to be contraindicated. In goiter the question depends entirely on how far the particular variety of disease has interfered with the proper functionating of the gland. The only constant result has been that the size of the goiter is reduced by its administration.

Skin-diseases.—The rapid and marked changes that occur in the skin of a patient suffering from myxedema while under thyroid treatment suggest its use in various dermatoses. Psoriasis and eczema, particularly the chronic varieties, have received considerable attention. At present, while some successes have been recorded, there is no rule that determines the probability of success, and even the treatment may aggravate the disease. In lupus Bramwell found more encouragement. The cutaneous lesions of malignant syphilis were markedly benefited, in the experience of Menzies, by thyroid medication. Various other conditions have been, with more or less reason, treated by the administration of thyroid preparations. The physician, bearing in mind the physiologic action of these, can determine the probability of success. The influence of the thyroid upon nutrition is available in the treatment of ununited fractures. Allusion must be made to observed facts bearing upon the supplemental secretion of one gland in the deficient action of another. In **akromegaly** it is highly probable the impaired or abolished functions of the pituitary body are taken up by the thyroid gland, and that with the exhaustion of that gland symptoms of myxedema may supervene. To some extent, then, the symptoms of akromegaly may remain in abeyance during the period of exaggerated activity of the thyroid. Further, improvement in some respects has followed the use of thyroid preparations in akromegaly. Whether this supplementary action is reciprocal or not, so far as is known no recorded facts are at hand upon which to base an opinion. Within the boundaries now accurately delineated thyroid preparations have their use, based upon sound physiology and pathology; if their use is improper, the theories in regard to the disease are at fault, and not the facts now well ascertained. See ORGANOTHERAPY; SERUMTHERAPY.

TIBIA.—See LEG.

TIC. See CONVULSIONS.

TIC DOULOUREUX (Prosopalgia). See NEURALGIA.

TICK.—See BITES AND STINGS.

TICK FEVER.—An obscure tropical disease prevalent in certain districts of Africa transmitted by several varieties of ticks or wood-lice. It is closely similar to, and upon further investigation may be proved identical with relapsing fever (*q. v.*) due to the spirillum Obermeieri. About a week after the bite the disease is ushered in with prostration, headache, pain in the back and legs, anorexia, vomiting, diarrhea, fever ranging from 101° to 104° F. There may be splenic enlargement. There are several febrile paroxysms of several days' duration occurring about every fortnight.

TIGLIUM.—See CROTON OIL.

TINCTURE (Tinctura).—In pharmacy an alcoholic solution of the medicinal principles of a drug, and, excepting the tincture of iodin, of nonvolatile bases. Tinctures are prepared by percolation, maceration, solution or dilution; the menstrua employed being chiefly alcohol, diluted alcohol, and alcohol and water in various proportions. Two ammoniated tinctures are made with aromatic spirit of ammonia, in one acetic acid is an ingredient of the menstruum, and several have glycerin. The official tinctures are now practically in two classes as to strength, 10 percent for the more powerful ones, and 20 percent for the others, with a few exceptions. They number 63, the figures placed after each giving the number of grams of the drug in each 100 c.c. of the tincture: **Tinctura** aconiti 10, T. alces 10, T. aloes et myrrhæ 10, T. arnicæ 20, T. asafetidæ 20, T. aurantii amari 20, T. aurantii dulcis 50, T. belladonnæ foliorum 10, T. benzoini 20, T. benzoini composita 10, T. calendulæ 20, T. calumbæ 20, T. cannabis indicæ 10, T. cantharidis 10, T. capsici 10, T. cardamomi 10, T. cardamomi composita 2 1/2, T. cimicifugæ 20, T. cinchonæ 20, T. cinchonæ composita 10, T. cinnamomi 20, T. colchici seminis 10, T. digitalis 10, T. ferri chloridi 13 1/4, T. gallæ 20, T. gambir composita 50, T. gelsemii 10, T. gentianæ composita 10, T. guaiaci 20, T. guaiaci ammoniata 20, T. hydrastis 20, T. hyoscyami 10, T. iodi 7, T. ipecacuahnæ et opii 10, T. kino 5, T. krameriæ 20, T. lactucarii 50, T. lavandulæ composita 0.8, T. limonis corticis 50, T. lobeliæ 10, T. moschi 5, T. myrrhæ 20, T. nucis vomicæ 2, T. opii 10, T. opii camphorata 0.4, T. opii deodorati 10, T. physostigmatis 10, T. pyrethri 20, T. quassiæ 20, T. quillajæ 20, T. rhei 20, T. rhei aromatica 20, T. sanguinariæ 10, T. scillæ 10, T. serpentariæ 20, T. stramonii 10, T. strophanthi 10, T. tolutana 20, T. valerianæ 20, T. valerianæ ammoniata 20, T. vanillæ 10, T. veratri 10, T. zingiberis 20.

For **tinctures of fresh herbs** (*Tincturæ Herbarum Recentium*), the pharmacopeia prescribes a general formula, according to which, when not otherwise directed, they are to be prepared by macerating 50 grams of the fresh herb, bruised or crushed, in 100 c.c. of alcohol, for 14 days, then expressing the liquid and filtering.

TINEA.—See RINGWORM.

TINEA VERSICOLOR (Pityriasis Versicolor, Chromophytosis).—A vegetable parasitic disease, due to the microsporon furfur, characterized by furfuraceous, yellowish, macular patches, occurring chiefly upon the trunk.

Symptoms.—The disease begins by the appearance of yellowish macules, from the size of a pin's-head to that of a pea, scattered over the affected region. These, in the course of a few weeks or months, increase in size and coalesce, with the production of large patches. The patches are irregular in shape with sharply defined edges. The color is usually fawn, although it may vary from a pale yellow to a brown; occasionally it has a distinct pinkish tint. The affected area is covered by a fine, furfuraceous, mealy scaling. When this is not apparent, it may be made evident by scratching the surface with the finger-nail.

The eruption is usually confined to the trunk, particularly the chest and interscapular region. The neck, axilla, arm, and in rare cases the face, may also become involved. Itching of a mild character is usually present.

Tinea versicolor pursues a chronic course, lasting, untreated, for months and years. The disease, with rare exceptions, is confined to adults. It is but slightly contagious.

Etiology.—The disease is due to the presence and growth in the skin of the microsporon furfur.

Pathology.—The corneous layer is permeated with a luxuriant growth of mycelium and spores. The mycelium consists of short, jointed, and angular threads, which may be clear or contain spores. The spores are rounded, highly refractive bodies, varying in size from 9/100 to 3/100 of an inch in diameter. In tinea versicolor there is a characteristic tendency of the spores to become aggregated in masses.

Diagnosis.—Tinea versicolor may easily be distinguished from chloasma, vitiligo, and the macular syphiloderm by attention to the character and distribution of the eruption. In doubtful cases the microscope will decide the question.

Prognosis.—The disease responds promptly to treatment. Relapses are not infrequent.

Treatment.—The treatment is rapidly efficient, a few weeks sufficing in most cases to establish a cure.

℞. Precipitated sulphur, ʒ j
Salicylic acid, gr. xx
Benzoinated lard, ℥ j.
Rub in twice a day.

Solutions of hyposulphite of sodium (1 dram to 1 ounce) and bichlorid of mercury (1 to 4 grains to 1 ounce) are easy of application and eminently useful.

It is well to continue the treatment for some time after apparent cure in order to preclude the possibility of relapse.

TINNITUS AURIUM.—The subjective ringing, roaring, or hissing sound heard in the ears in various affections of the tympanum and internal ear, and also after the administration of certain drugs in large doses, notably quinin.

It may be continuous or intermittent, of all characters, and localized in the ear or extending over the cranium. Tinnitus is a frequent symptom of disease of the external, middle, or internal ear. It is usually present when there is undue pressure on the labyrinth. Cerumen on the tympanic membrane, imperfect entrance of air into the tympanum from obstruction of the caliber of the Eustachian tube, or effusion into the tympanic cavity will cause it. It follows blows on the head, and is a prominent symptom in all nervous affections of the auditory apparatus. An altered condition of the blood-vessels, anemia, cerebral congestion, large doses of quinin, deranged digestion, and diseases of central origin, are causes. It occurs as a prelude to epileptic attacks, syncope, or vertigo, and is not uncommon in the gouty or uric acid diathesis.

Treatment.—Any curable local condition should be treated, and the general health improved. The tinnitus in nervous affections is very intractable. The most useful tonic is strychnin, while quinin exerts a distinctly injurious effect, particularly in large doses. See EAR (Diseases).

TITUBATION.—The staggering gait and incoordination of motion accompanying certain diseases of the spine and cerebellum; also the staggering gait of the drunkard.

TOBACCO (Tabacum).—The dried leaves of *Nicotiana tabacum,* native to America. Its properties are mainly due to an alkaloid, nicotin, $C_{10}H_{14}N_2$, which, next to prussic acid, is the most rapidly fatal poison known. Tobacco is but rarely used in medicine; but it is a powerful depressant, nauseant, emetic, diaphoretic, and antispasmodic; it is also narcotic and sedative, lowering arterial tension. In toxic doses death occurs by paralysis of the respiratory centers. It is used chiefly as an antispasmodic, and is said to be effectual in tetanus. **T. Enema,** 20 grains in 8 ounces of hot water for each enema. **T., Ol.,** obtained by distillation; violently poisonous. **T., Vinum,** 1 ounce to 1 pint. Dose, 5 minims to 1 dram. **Nicotin,** the alkaloid, efficient in tetanus and strychnin poisoning. Dose, 1/20 to 1/10 minim and up to 2 minims in 2 hours. Preparations unof. See LAMBERT TREATMENT for NARCOTIC ADDICTION.

TOE, Amputation.—See FOOT (Amputation).

TOLU.—See BALSAM.

TONGUE, DISEASES.—**Tongue-tie** is due to the tongue being more or less tightly bound down to the floor of the mouth by the shortness of the frenulum. It is likely, when well marked, to interfere with sucking, and later, with distinct speech. It is easily remedied by dividing the frenulum with probe-pointed scissors, care being taken to direct the points downward and backward and merely to notch the free border, lest the ranine artery be wounded—an accident that, in infants, has been attended by severe and, in some cases, fatal hemorrhage. If the division of the frenulum is too free, the tongue may loll backward, pressing the epiglottis over the entrance of the larynx, and produce severe dyspnea or even fatal asphyxia—"swallowing the tongue," as it has been called. On drawing the tongue forward the symptoms will at once cease; but a ligature should be passed through its tip and secured to the cheek, with instructions to again draw the tongue forward with ligature should the symptoms recur.

Macroglossia, or hypertrophy of the tongue, may be congenital or acquired. In either case it is rare.

Causes.—The affection appears to be due to occlusion of the lymphatics at the base of the tongue; at any rate, the lymphatics are found enlarged and distended with lymph, and the connective tissue is increased in amount and infiltrated with lymphoid corpuscles. It appears related, therefore, to elephantiasis—a condition sometimes found coexisting in the neck and other parts of the body.

Symptoms.—The whole tongue is uniformly enlarged, and sometimes so much so that it presses forward the alveolar process of the lower jaw with the incisor teeth, and protrudes from the mouth, hanging as low as the chin. When thus exposed, the mucous membrane becomes cracked, spongy, and bluish-red, and is subject to repeated attacks of subacute glossitis.

The treatment is excision of part of the organ. The removal of a V-shaped piece has been attended by excellent results. It should be done before the teeth and jaw have been deformed by the pressure.

Acute parenchymatous glossitis, or deep inflammation of the tongue, may be due to mercury, fever, iodism, injury, carious teeth, stings of insects, abscesses beneath the jaw; sometimes there is no apparent cause.

Symptoms.—In severe cases the whole tongue is swollen, and protrudes from the mouth, interfering with speech and deglutition, and sometimes threatening suffocation. It frequently ends in abscess. It is often attended with high fever and salivation, and may be quite sudden in its onset.

Treatment.—Should a brisk purge and the milder measures applicable to acute inflammations fail, free longitudinal incisions, which need not be deep, should be made along the dorsum of the tongue, and the swelling will usually subside in a few hours.

Suppuration and abscess sometimes follow an attack of acute glossitis; but the preceding inflammation may be so slight as to be overlooked. The abscess, which then forms a firm, tense, elastic swelling in the substance of the tongue, may be mistaken for a gumma or carcinoma; but the diagnosis is readily made by an exploratory puncture. A free incision is the proper **treatment,** the cavity filling up in a few days.

Chronic superficial glossitis (*leukoplakia buccalis*), also known as psoriasis, or ichthyosis of the tongue, or smokers' patches, is a chronic inflammation of the mucous membrane, and may be induced by syphilis, excessive smoking, some forms of dyspepsia, the abuse of spirits, jagged teeth, etc. It may be found associated with psoriasis. The mercurial treatment of syphilis may be a factor in its etiology. The disease has a marked tendency to become malignant.

Treatment.—All sources of irritation, especially smoking, stimulants, and condiments, should be avoided; antisyphilitic remedies should be given when indicated; gastritis, if present, should be treated; and soothing washes of chlorate of potassium, or sodium bicarbonate (20 grains to the ounce) should be applied. Should any of the leukoplakial patches show signs of ulceration, the whole patch should be excised at once; or should signs of epithelioma already be present, the whole or half of the tongue should be removed.

Simple ulceration may depend on digestive disturbance (*dyspeptic ulcer*) or on irritation, as of a sharp or carious tooth, hot pipe-stem, etc. (*dental or irritable ulcer*). Both varieties are generally superficial, and unattended by the induration and infiltration characteristic of epithelioma. The *dyspeptic ulcer* usually occurs on the dorsum of the tongue near the tip. The ulceration is sometimes extensive and multiple, and is often accompanied by some superficial glossitis at other parts of the tongue. The *dental ulcer* is situated on the side of the tongue, and generally corresponds with a carious or sharp tooth. At first it may be a mere superficial, red abrasion, but if neglected, it becomes a distinct ulcer, irregular in shape, and surrounded by an inflammatory area. The edges are abrupt and a little raised, but not everted; the base is depressed, sloughing, and sometimes phagadenic, but not indurated unless the ulcer has existed some time, when it may become callous. It is always unattended by infiltration.

Treatment.—In the *dyspeptic ulcer* the diet and bowels must be carefully regulated, bismuth or sodium in infusion of calumba given internally, and soothing washes or borax and honey applied locally. Caustics must be avoided. In the *dental ulcer* any offending tooth must be filed, stopped, scraped, or extracted; in short, every source of irritation removed. The ulcer will then heal rapidly, but if neglected, it may become epitheliomatous. On the first appearance of infiltration, therefore, free excision is imperative.

Tubercular ulceration of the tongue is rare, and generally occurs in young adult males, the subjects of phthisis or of general tuberculosis. It usually begins as a small pimple or nodule on the dorsum of the tongue, especially near the tip. This, after a short time, breaks down into round, oval or irregular, painful ulcer. The edges are slightly raised, vertical, inverted, or undermined, sometimes slightly thickened, but never everted or greatly indurated. The base is uneven or nodular, and covered with coarse, pinkish-gray granulations, or with a gray or yellow shredded slough. Sometimes several smaller ulcers appear around the one first formed, and coalesce with it. The ulceration usually progresses in spite of treatment, the patient dying of phthisis or other tubercular affection. The absence of glandular enlargement, of induration, and of signs of syphilis, along with the presence of tubercle elsewhere, and the characters enumerated, should serve to distinguish it from syphilitic and epitheliomatous ulceration.

Treatment has hitherto been of little avail. The ulcer, however, may be soothed by Ferrier's snuff or cocain; or if the constitutional state does not forbid, it may be scraped with a Volkmann's spoon, and dusted with iodoform, cauterized with nitrate of silver, or cut out. The usual constitutional treatment for tubercle should, of course, at the same time be employed.

Syphilitic ulceration may be divided for practical purposes into the superficial and deep, the former commonly occurring in the early, the latter in the later, stages of syphilis.

Treatment.—Large doses of iodid of potassium, combined with quinin, if the constitution is at all broken, and the local application of a cleansing gargle, as chlorate of potassium, will rapidly cause them to heal. The scars left by these ulcers sometimes, though rarely, degenerate into epithelioma. Should any induration, therefore, appear in them, their free removal with the knife should at once be undertaken.

Epitheliomatous ulceration is due to the breaking down of squamous carcinoma. It is described under ulceration instead of among new growths, as, in consequence of the irritation from the teeth and the movements of the tongue, epithelioma in this situation very rapidly ulcerates, even if it does not begin as an ulcer; hence, it is from other ulcers rather than from new growths that it has to be distinguished. It is much more common in men than in women, and seldom occurs under the age of 40. Often it is due to some form of irritation such as that produced by a carious or sharp tooth, or a syphilitic ulcer, or leukoplakia. Occasionally it begins as a wart or pimple in patients in whom no cause for it can be assigned. It is most common on the side of the tongue opposite the molar or bicuspid teeth. The ulcer is irregular, with raised, sinuous, hard, and everted edges, and uneven, excavated, or warty base; while the tissues around are infiltrated and indurated. Its growth is generally rapid, and attended with neuralgic pain and copious salivation. If allowed to take its course, it spreads backward to the pillars of the fauces, downward to the floor of the mouth, and inward to the opposite half of the tongue; while the submaxillary lymphatic glands, and later the lymphatic glands in the neck, become enlarged, and the parts about the angle of the jaw infiltrated and matted together by the disease. Secondary ulcers then form from the breaking down of the glands in the neck, and the patient dies, worn out by pain and irritation, or exhausted by hemorrhage; but, like squamous carcinoma in other parts, it seldom becomes disseminated in distant organs.

Treatment.—Early and free extirpation ought, in every instance, to be undertaken, but even then a recurrence in the glands of the neck is only too frequent. When the disease has attained some magnitude, the propriety of removal becomes a question, and opinions differ as to under what circumstances it ought to be attempted. Its removal is contraindicated: (1) When it has extended so far backward that the finger cannot reach healthy tissue beyond it; (2) when it is firmly and extensively adherent to the jaw; (3) when the tongue is firmly bound down to the floor of the mouth; (4) when the glands not only below the jaw, but deep in the neck, are much implicated; and (5) when the patient is too weak or emaciated from the disease itself, or from disease of other organs, to withstand an operation. Moderate enlargement of the glands, slight adhesion to the jaw, and some infiltration of the floor of the mouth, do not, it is thought, forbid an operation (especially if the patient is suffering from much pain, and is otherwise in good health), provided the whole of the disease with the enlarged glands can be removed. When the disease is regarded as beyond the reach of extirpation, the pain and salivation may often be relieved by removing not only decayed, but sound, teeth that may be irritating the growth, or by stretching or dividing the gustatory nerve. This, which, however, is sometimes impracticable on account of the extension of the growth, may be done by making a small incision transversely from the last molar tooth through the mucous membrane to the side of the tongue, then passing an aneurysm needle into the wound, and hooking up the nerve, which is here quite superficial. Cocain, or morphin and glycerin, may be painted on the part, while the patient's remaining span of life may be rendered bearable by increasing doses of opium or morphin (Walsham).

Tumors of the Tongue.—*Papillomatous or warty growths* are not uncommon, and may be distinguished from epithelioma, into which they are liable to degenerate as age advances, by the absence of induration about their base. They should be freely removed by the knife or scissors. *Vascular tumors* or *nævi* and *lymphangiomata* are occasionally met with, and may be destroyed by the ligature or knife. *Fibrous, fatty, myxomatous, adenomatous, sarcomatous,* and *carcinomatous tumors* other than the squamous variety, which has already been described under epitheliomatous ulceration, are too rare in the tongue to call for further remark.

Syphilis of the Tongue.—*Primary chancres,* which are very rare in this situation, require no description. *Mucous tubercles* consist, as elsewhere, of heapings up of epithelium over infiltrated and enlarged papillæ, and appear as flattened elevations of a grayish-white color. They are generally present on the palate and fauces at the same time. Mercury internally, and black wash locally, cause them rapidly to disappear. *Superficial glossitis* and the *superficial* and *deep ulcerations* have already been described. *Gumma* occurs as a hard, globular mass in the fibrous tissue of the septum, and also in the substance of the muscles. It may be single or multiple. The mucous membrane covering it is at first natural in appearance, but as the gumma softens, it gives way, and a deep syphilitic ulcer is produced. Iodid of potassium is the remedy.

See Hypoglosal Nerve.

TONGUE, EXCISION. Excision with the knife, on account of the profuse hemorrhage that attends it, is only applicable when the anterior portion of the tongue requires removal. The tongue should be well drawn forward, and the diseased portion cut away with one sweep of the knife, and the bleeding vessels tied.

The écraseur is much less used than formerly. The mouth having been widely opened by a gag, two ligatures are passed through the tongue, one on either side of the tip, and the mucous membrane, where it is reflected from the tongue to the jaw, is divided with scissors along with some of the fibers of the geniohyoglossus. The mucous membrane covering the dorsum of the tongue is next divided in the middle line by a bistoury, from the tip as far back as to be well beyond the disease. This allows the tongue to be readily split with the fingers into two halves. The cord of the écraseur is now passed over one-half, and well behind the disease, and, if the whole tongue is to be removed the cord of a second écraseur over the other half. The cord being tightened by screwing up the écraseur, the tongue is cut through. The lingual artery, with the gustatory nerve, is drawn out in the form of a loop by the cord of the écraseur. A ligature should be passed around the artery with an aneurysm needle, and the artery severed in front of the ligature. The anterior part of the tongue will now come away, leaving the ligature on the artery in the stump of the tongue.

Excision with the scissors (Whitehead's method) consists in drawing the tongue well forward by two ligatures through its tip, dividing the frenulum. splitting the tongue as previously described, and then separating the diseased half from its attachments, beginning from below by a series of short snips with blunt-pointed scissors, clamping or tying the lingual artery, if seen, before it is divided, or else immediately after it is cut. The lingual artery lies immediately below the muscle substance about 1/4 inch from the middle line. If the disease involves both sides of the tongue, the opposite half can next be removed in the same way. Should bleeding occur, it can always be arrested temporarily by merely passing the finger into the pharynx and pressing the tongue against the inner surface of the jaw, and then as soon as the mouth has been sponged clear of blood, the bleeding vessel can be seized and tied. Or Lockwood's clamp for compressing the lingual artery may be used during the operation if the surgeon fears severe hemorrhage, the only objection to it being that it is likely to get a little in the operator's way. Some surgeons operate with the patient's head hanging over the end of the table, so that the blood may not run down into the throat. When Hahn's cannula is used, it is often kept in for several days after the operation, for the purpose of excluding septic discharges from the air-passages and so preventing septic pneumonia. The advantages of the scissors over the écraseur are that a cleaner-cut surface is left and consequently that the surgeon can be more certain of having removed the whole of the disease; that less sloughing occurs; and that the operation is more quickly performed. When, however, the tongue is adherent to the floor of the mouth and hence cannot be drawn forward, or the mouth cannot be opened sufficiently wide, or the light is bad, or a reliable assistant is not at hand, removal with the scissors is attended with considerable difficulty, and under these circumstances removal with the écraseur will be found safer (Walsham).

Excision with the galvanocautery is strongly recommended by some surgeons, but is open to the serious objection that it is liable to be followed by secondary hemorrhage on the separation of the sloughs.

Kocher's Operation.—A preliminary tracheotomy is performed, and an ordinary cannula inserted. Entry of blood is prevented by plugging the pharynx with a sponge soaked in carbolic acid. The incision runs along the anterior border of the sternomastoid from the ear down to nearly the middle of the muscle; from this it turns forward to the hyoid bone and along the anterior border of the diagastric to the symphysis. A flap, containing skin, platysma, and fascia, is reflected upward; the facial artery and vein are tied; the lingual artery is secured on the hyoglossus; and the submaxillary fossa is completely cleared out, beginning from behind. All the cellular tissue is removed, together with the lymphatic glands, and the submaxillary and sublingual glands are removed if they appear involved. The mylohyoid muscle is then separated, the mucous membrane divided, and the tongue drawn through the opening. If the whole thickness is removed, the opposite lingual must be tied as well.

Preliminary Treatment.—Before commencing the operation, the mouth and the nasal cavities are thoroughly washed out with a solution of bichlorid of mercury (1 : 2000); and after it is finished and the wound adjusted with sutures, the surface of the stump and the pharynx behind it are covered over completely with a sponge soaked with carbolic acid. The dressings are changed twice a day, advantage being taken of the opportunity to pass an esophageal tube and feed the patient; for the rest, nutrient enemata are used. The operation is undoubtedly more extensive than the others, but it is believed that this is amply compensated for by the thoroughness with which the whole of the affected tissue is removed and the way in which the risk of septic inflammation and pulmonary complications is avoided. Kocher himself has been very successful as regards immediate mortality, but the operation does not seem to have been performed by other surgeons to any great extent.

The after-treatment of these cases requires even more than ordinary care. Every endeavor must be used to prevent putrefaction, which, owing to the temperature, moisture, and alkaline reaction, is very prone to follow; the patient's strength must be husbanded and maintained in every way; and precautions taken to prevent food or the discharge from the wound entering the lungs. With this in view, Kocher fills the entire cavity, from the edge of the wound back into the mouth and pharynx, with a sponge soaked in carbolic acid solution, shutting off the nasopharyngeal cavity on the one hand and the larynx and pharynx on the other. The same object may, however, be achieved much more satisfactorily by means of a plan recommended by Barker: The whole wound is carefully cleansed, dried, and dusted with iodoform, and the two ends of the incision sutured. In the middle a piece of rubber tubing is adjusted, long enough to reach well down into the esophagus; and all the space around is carefully packed with antiseptic wool. This can be left untouched for days, the patient being easily fed by means of a funnel as often as it may be required.

TONGUE IN DIAGNOSIS.—The tongue is a general index of disease, whether its condition is a local manifestation of a constitutional disturbance or whether the process is limited. The coated tongue of certain gastric disorders, the reddened tongue of fever, the strawberry tongue of scarlatina, the brown coating and fissuring of the typhoid tongue, the hypertrophic and thickened tongue of myxedema and akromegaly, and the pigmented tongue of suprarenal disease are all characteristic. Herpes febrilis, mucous patches, aphthous stomatitis, and thrush often have their starting-point in this organ.

The elongated and pointed tongue indicates a condition of irritation and determination of blood to the stomach and bowels. The full tongue, broad and thick, is evidence of atony, want of action in the digestive tract. The dry, pinched tongue expresses a want of functional activity in the digestive organs. It is the tongue of acute disease, and is usually associated with dryness. The fissured tongue in chronic disease indicates inflammatory action of the kidneys. The fissured tongue in advanced stages of acute disease is significant of lesions of the kidneys or irritation of the nerve-centers. In many cases there is a defect in the secretion of urine.

Dryness and moisture are important evidences of the condition of the digestive organs. If the tongue is dry, the stomach and intestines are disordered. In acute disease with dryness of the tongue, when it becomes moist, improvement is indicated, and it is nearly always looked upon as a favorable symptom.

The thin, transparent coating of the tongue gives evidence of enfeebled digestion, frequently from intemperate eating and drinking. A tongue coated heavily at the base calls attention to accumulations in the stomach, and suggests the use of an emetic. The broad pallid tongue gives evidence of a want of the alkaline elements of the blood. It may be the basis of the disease, which will fade away as soon as the proper alkali is given, or it may be but a portion, the alkaline salt preparing the way and facilitating the action of other remedies. The deep red tongue, generally dry, indicates an acid.

TONICS.—Medicine or agents that promote nutrition, and give tone to the system. The most typical agents are strychnin, quinin, iron, and the vegetable bitters. Those especially acting on the stomach are arsenic, bismuth, cinchona, hydrastis, and nux vomica; on the spinal cord and general circulation, strychnin; on the heart, digitalis, squill, convallarin, and cimicifuga; on the general nervous system, phosphorus, quinin, and the valerates; on muscular tissue, tannin; on the blood, iron, manganese, cod-liver oil, and other fats.

In administering tonics care is required to see that the tonic is suitable to the case; for in apparent debility and imperfect functional activity, imperfect removal of tissue or other waste is responsible. Not tonics, but cholagogs, purgatives, etc., are then indicated. Tonics are employed in debility of the whole or part of the body; the character of the medicinal agent depends upon the part affected.

General tonic prescriptions:

℞.	Quinin sulphate,	gr. xx
	Dried iron sulphate,	gr. xl
	Strychnin sulphate,	gr. ss.

Divide into 20 pills. Give 1 pill 3 times a day.

℞.	Tincture of iron chlorid, Dilute phosphoric acid,	each, ℥ ss
	Simple syrup, add enough to make	℥ iij.

A teaspoonful 3 times a day.

℞.	Arsenic trioxid,	gr. j
	Strychnin sulphate,	gr. 1/3
	Quinin sulphate,	ʒ j.

Divide into 20 pills. One pill after each meal.

℞.	Iron sulphate,	gr. xij
	Magnesium sulphate,	ʒ vj
	Dilute sulphuric acid,	ʒ j
	Infusion of quassia,	℥ vj.

Tablespoonful in water 3 times a day.

℞.	Solution of potassium arsenite,	♏ x
	Fluidextract of nux vomica,	♏ xx
	Compound tincture of gentian, Tincture of cinchona, Tincture of calumba, Wine of kola,	each, ℥ iv.

A wineglassful after each meal.

℞.	Tincture of nux vomica,	ʒ ij
	Tincture of cinchona enough to make,	℥ iv.

A teaspoonful after each meal.

In atonic dyspepsia:

℞.	Dilute nitrohydrochloric acid,	ʒ vj
	Solution of strychnin,	ʒ jss
	Tincture of orange, Tincture of calumba,	each, ℥ j
	Compound infusion of gentian, add enough to make	℥ x.

Tablespoonful in a wineglassful of water 3 times daily, after eating.

Or:

℞.	Strychnin sulphate,	gr. j
	Dilute nitrohydrochloric acid,	ʒ j
	Compound tincture of gentian,	℥ j
	Compound tincture of cardamom,	℥ ij
	Solution of pepsin, add enough to make	℥ iv.

A teaspoonful after each meal.

TONSILLITIS (**Amygdalitis**). **Varieties.**—(1) acute; (2) chronic; (3) phlegmonous (quinsy, tonsillar abscess).

Etiology.—(1) It most often occurs during youth or adolescence; (2) exposure to the cold and wet; (3) heredity; (4) certain diseases, such as lithemia, rheumatic diathesis; (5) changeable climate.

Pathology.—In the first stage, superficial, of acute **tonsillitis** the catarrhal inflammatory process is principally confined to the mucous membrane of the tonsil, which is covered with a viscid secretion. The epithelium desquamates rapidly. The organ is enlarged from congestion of the blood-vessels. In the second stage, lacunar or follicular, the epithelium collects in the crypts, and undergoes necrosis, forming small, whitish, offensive, cheesy masses, which obstruct the secretion of the gland. In the last stage, parenchymatous, a phlegmon may form constituting circumtonsillar abscess or quinsy.

Symptoms and Clinical Course. Acute follicular Tonsillitis.—The onset is generally marked by chilliness or a general body ache. The temperature may rise suddenly—often to 104° F.—within the first 24 hours. The region of the affected part is dry, hot, and gives rise to severe pain on swallowing or on opening the mouth. The tonsils are enlarged, and may be felt externally. The surface is usually covered with a thick whitish mucus, often offensive. The tongue is heavily coated; urine high colored, scanty, and contains excess of urates. In the follicular stage the glands are red and swollen, and in the crypts are seen the small, whitish, cheesy plugs, which are the remains of degenerated epithelium. They may often be brushed away in making local applications, leav. ing small depressions in the glandular substance- In many cases they become detached, and are cast off with the expectoration.

Chronic Tonsillitis.—The lacunæ of the tonsil are filled with debris which impart a fetid odor to the breath. From time to time these cheesy masses are expectorated. The quality of the voice may be altered. There is a more or less constant cough. The tonsils may be slightly or markedly enlarged.

Phlegmonous Tonsillitis (Quinsy).—The affected organ is very painful and greatly distended by the purulent collection, which may be throbbing in character. The jaws are stiff, and the mouth cannot be opened. Often the pain is diffused over the whole angle of the jaw. The jaws may be edematous, and fluctuation may be obtained on palpation of the parts.

Deglutition is painful, and often entirely lost; the voice becomes hoarse, and has a nasal character; saliva is greatly increased. The fever is higher, as a rule, and the suffering more intense than in the other varieties of tonsillitis.

Diagnosis.—

TONSILLITIS.	DIPHTHERIA.	SCARLET FEVER.
1. History of exposure to cold and wet; rheumatic diathesis, or history of previous attack.	**1. History of contagion.**	**1. History of contagion.**
2. Onset sudden; high fever rising rapidly.	**2. Onset gradual. Urine quickly showing albumin and casts.**	**2. Onset sudden; strawberry tongue; scarlet red rash; pulse rapid, out of proportion to temperature; convulsions frequent.**
3. Severe pain in region of tonsil on opening the mouth; moderate prostration.	**3. General body pain as well as pain in angle of jaws; severe cough or bronchitis may be present; prostration severe.**	**3. Prostration severe.**
4. Absence of membrane in all forms; small cheesy lumps in the crypts of gland in follicular tonsillitis.	**4. Grayish-white membrane, and on being pulled off leaves behind a bleeding surface; membrane contains Klebs-Loeffler bacilli.**	**4. False membrane may be present, but absence of Klebs-Loeffler bacilli.**
5. No sequels; symptoms subside quickly.	**5. Paralysis of nerves of pharynx or eye common.**	**5. Tendency to nephritis.**

Prognosis is favorable, except in the phlegmonous form, which may involve the deeper tissues, and extend downward behind the carotid sheath, causing death.

Treatment of Acute Follicular Tonsillitis.—In the majority of cases it is well to begin the treatment by the administration of calomel in fractional doses, or saline purgatives. Should there be a rheumatic diathesis, sodium salicylate, or preferably aspirin, 7 grains every 3 or 4 hours, should be given. If temperature is high (102.5° F.), phenacetin, 5 grains every 4 hours, and quinin, 4 grains, may be given from the onset of the symptoms.

℞.	Tincture of aconite,	♏ xl
	Elixir curacoa,	ʒ iij
	Solution of potassium citrate, add enough to make	℥ iij.

Tablespoonful every 3 or 4 hours.

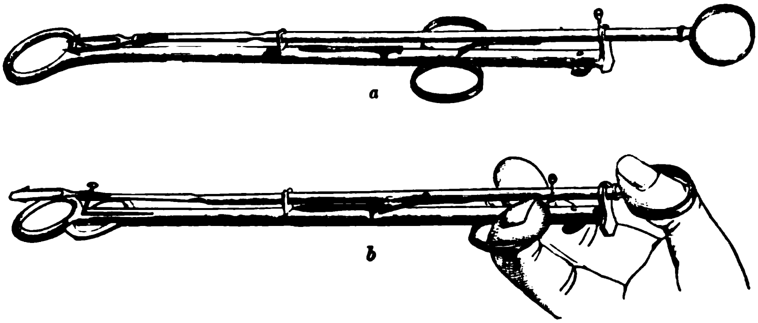
Guaiac may be given in the form of the compound tincture, 1 dram with milk every 4 hours, or may be used as a gargle. It may also be administered in the form of a lozenge:

℞.	Guaiac,	ʒ v
	Oil of lemon,	♏ x
	Oil of peppermint,	♏ iv
	Acacia,	ʒ ss
	Sugar,	ʒ jss.
	Confection of rose, add enough to make 30 lozenges.	

Allow 1 to dissolve in the mouth every 3 or 4 hours.

Local Treatment.—Small pellets of ice may be allowed to dissolve in the mouth to relieve the inflammation. If the application of cold is disagreeable, hot compresses may be substituted. Occasionally, spraying through the anterior nares with an alkaline solution (see PHARYNGITIS) will prevent mouth-breathing, and relieve the catarrhal process often present in these parts.

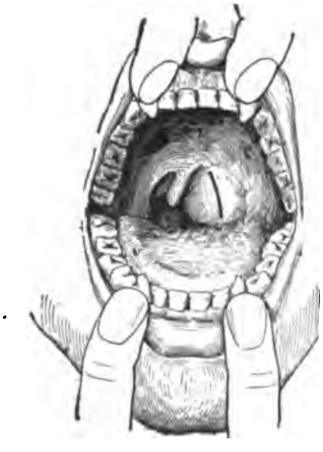
Local applications of nuclein solution (5 percent) twice daily, and also internally in doses of 1 teaspoonful every 4 hours, are valuable. Bicarbonate of sodium or aspirin applied locally may afford marked relief.



TONSILLOTOME.—(*Zuckerkandl.*)

Treatment of Chronic Tonsillitis.—If the tonsils are not enlarged the crypts should be emptied by the curette and obliterated by some caustic such as silver nitrate or preferably by the galvano-cautery. If the tonsil is enlarged it should be removed with the snare or guillotine. If this is not permitted, daily gargling with antiseptic solutions should be insisted upon and applications of strong tincture of iodin or trichloracetic acid should be made to the crypts. Daily cold bathing especially of the neck, is excellent. It is important to pay attention to the general health in regard to food, exercise, clothing, and tonics.

Treatment of Phlegmonous Tonsillitis.—Hot applications should be applied to the angles of the jaw; at the earliest possible moment, the abscess should be opened with a sharp pointed (but guarded) tenotome, the incision being parallel with the anterior pillar of the fauces, and directed toward the middle line. In all cases the diet should be light and nutritious.



LINE OF INCISION IN QUINSY.—(*Veau.*)

TONSILS, HYPERTROPHY.—Chronic enlargement of the tonsils is very common in strumous children, in whom it is frequently associated with adenoid growths in the vault of the pharynx. At times it appears due to oft-repeated attacks of acute tonsillitis.

The symptoms to which it may give rise are a nasal tone of voice; a peculiar vacant expression, acquired by the child constantly breathing with the mouth half open; regurgitaton of fluids through the nose; snoring during sleep; distressing dreams, from the imperfect aeraton of the blood; and recurring attacks of acute or subacute tonsillitis; deafness from implication of the eustachian tube and middle ear in chronic inflammation, may sometimes be induced, and even an alteration in the shape of the chest, and possibly phthisis. The tonsils appear irregularly enlarged, often almost occluding the fauces, but, unless inflamed, are of a natural color, or perhaps slightly paler than natural.

Treatment.—In young children the affection may be cured by persistent painting with the tincture of perchlorid of iron or tincture of iodin, combined with the internal use of cod-liver oil and syrup of the phosphate or the iodid of iron. In older children, or when the tonsils are much enlarged, they should be excised, either with the knife or, better, with the guillotine, and this should be done before the voice has become seriously affected or other disturbance has ensued. The hemorrhage attending the operation, though usually slight, has at times been alarming. Gargling with cold water will generally stop it; but if this fails, ice or astringents, as tannic acid, or pressure with a pencil guarded with lint will nearly always succeed. Should a bleeding vessel be seen, it should be tied or twisted. In exceptional cases the common carotid has had to be tied. Should adenoid growths be present, they should be removed at the same time as the tonsils. See ADENOID VEGETATIONS, PHARYNGITIS, RHINITIS.

TOOTHACHE.—This is a symptom of caries, periostitis, exostosis, inflamed pulp, or neuralgia, and ultimately the patient should be sent to a denist. Temporary treatment, however, is often demanded. If there is a cavity, it should be carefully cleansed with warm water and plugged with a pledget of absorbent cotton soaked in creosote, phenol, chloroform, oil of cloves, cocain, or other local anesthetic. A mixture such as the following may be used:

℞	Cocain hydrochlorid,	gr. iij
	Carbolic acid,	ʒ j
	Collodion,	ʒ j.

A small quantity to be applied to the dried-out cavity upon an absorbent-cotton plug.

Coley states that of all medicinal remedies for toothache none is so successful as sodium salicylate.

He believes it is especially useful in those cases when the pain is started by "taking cold." A dose of 15 grains will usually relieve the pain very promptly, and if this is repeated every 4 hours, the inflammation may entirely subside, leaving, of course, a carious tooth to be disposed of according to circumstances. The addition of belladonna is often advantageous. Fifteen grains of sodium salicylate with 10 minims of tincture of belladonna, will often procure refreshing sleep instead of a night of agony. It is especially valuable with children, when extraction of teeth is to be avoided, if possible, lest the development of the maxilla should be injured. See Dental Anodynes; Dentition (Disorders); Teeth, etc.

TORMINA.—Griping pains in the abdomen. See Colic, Dysentery.

TORTICOLLIS (Wry-neck).—An affection due to irregular contraction of the muscles, twisting the head. The sternomastoid is the muscle usually at fault—sometimes the only one—but the others and the cervical fascia often aggravate the evil. It may be primary, caused by disease of the muscle itself (this is usually distinguished as the congenital variety); or secondary, arising from inflammation of some of the structures near the joints, vertebræ, lymphatic glands, etc., or from a disordered condition of the nerve.

Congenital torticollis is rarely noticed until some time after birth. This arises partly from the shortness of an infant's neck, partly from the fact that the deformity itself is not nearly so well marked at this time of life as it is later. Its origin is uncertain. Probably it is due to partial rupture of the muscle at the time of parturition; at least a tender, ovoid mass is not infrequently found, shortly after birth, in the sternal head of the sternomastoid, just where the tendinous and muscular fibers meet; and in several cases wry-neck is known to have been present later in life. The back of the head is drawn down; the chin is directed toward the opposite side, so that the face looks somewhat upward, and the muscle itself stands out like a tense cord, with a hollow in front and behind. The sternal portion is usually the chief offender, and in severe cases the mastoid process may be dragged down so far as to lie immediately over and scarcely an inch from the sternoclavicular articulation. As a result, the cervical vertebræ become twisted and deformed; secondary curves make their appearance in the back; the under side of the face does not grow in proportion to the rest; the line of the eyes becomes oblique; and, if the condition is not remedied before puberty, even the breast fails in its development.

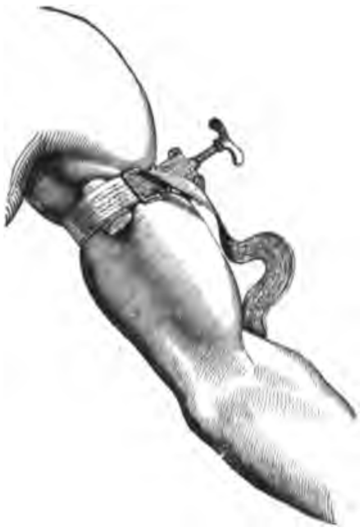
Treatment of Congenital Torticollis.—Unless the patient is treated by position while still an infant, division of the sternomastoid is generally required, followed by a course of systematic exercises in the milder cases, and the use of a supporting brace in the most severe. The sternomastoid is best divided immediately above the clavicle, as here it is furthest removed from the important structures that lie beneath it. A puncture should be made at the inner side of the tendon, a director passed behind it, and the division made toward the skin with a blunt-pointed tenotome. The tense bands of contracted cervical fascia that now start forward will yield to stretching; it is not safe to divide them. The head should be straightened, and held thus by a bandage and sand-bags. The puncture should be allowed 3 or 4 days to heal before the exercises are begun or the instrument is applied. Some advise the division of the muscle about the middle, believing that this is a more safe procedure; while others again recommend the division of the tendon by open incision, as in this way the danger of puncturing and admitting air into a vein is avoided. If the subcutaneous division, however, is carefully done in the manner here advised, there need be no fear of air entering the veins; sudden death has, however, occurred at the hands of some excellent surgeons, and others have met with alarming symptoms.

Acquired torticollis may be due to rheumatism or exposure to cold, or it may be symptomatic of inflammation of the lymphatic glands, the vertebræ, or other structures of the neck, the muscles (for in this case the splenius and others are in a state of tonic spasm as well) contracting to save the affected part. In many of these cases the diagnosis of the exciting cause is exceedingly difficult, and very great care is required, as cervical caries is by no means uncommon. Tonic torticollis of this character may always be distinguished from the congenital variety by its relaxing completely under an anesthetic, and by the absence of any shortening of the cervical fascia.

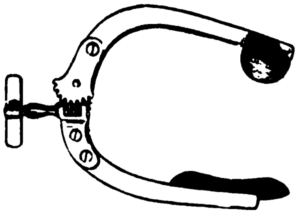
Treatment of Acquired Torticollis.—In spasmodic cases conium, Indian hemp, bromid of potassium, etc., may be tried. These failing, the spinal accessory nerve may be stretched just above the spot where it enters the sternomastoid. In very intractable cases a piece of the nerve may be excised, and if the posterior cervical muscles are also involved in the spasm, excision of portions of the posterior division of the first 4 cervical nerves may be simultaneously or subsequently undertaken. Tenotomy of the sternomastoid should in these and in hysteric cases on no account be performed.

TOUCH.—See Sensation (Disorders).

TOURNIQUET.—An instrument for controlling the circulation by means of compression. It usually consists of 2 metallic plates united by a thumb-screw and a strap provided with a pad. The strap is fastened about the part, the pad being placed over the artery to be occluded. The screw is placed diametrically opposite the pad, and the strap is tightened by separating the metallic plates of the screw. Dupuytren's tourniquet is one for compressing the abdominal aorta, consisting of a semicircle of metal with a pad at one extremity. Esmarch's tourniquet consists of a stout, elastic-rubber band applied above the proximal turn of an elastic bandage passing around the part to be exsanguinated. It has several disadvantages: It may cause paralysis; it encourages sloughing, especially if used to check primary hemorrhage before amputation; oozing following its removal is often very great; it is intensely painful. It is better to apply an Esmarch bandage first. Petit's tourniquet is used chiefly for the groin and the arm below the axilla. Its pad, or a roller about 1 1/2 inches in thickness, is placed upon the main vessel, the band buckled closely to the limb, and the screw turned so quickly as to compress the artery as soon as the veins and thus avoid passive congestion. To prevent the skin being dragged, a bandage around the limb is advantageous. Signorini's tourniquet has a pad at each end (one for pressure, the other for resistance), and is operated by a screw and ratchet in the middle so that the arc can be opened or closed at will. It is chiefly for use upon the femoral artery in the groin, the larger pad being placed beneath the tuberosity of the ischium. Lister's tourniquet is of large size, and intended for use on the abdominal aorta. It is to be placed on the patient's right side, so that the vessel does not slip off the fourth lumbar vertebra, is to be screwed up only at the last moment, and then only with enough force to interrupt the circulation.


Petit's Tourniquet.

Esmarch Band.


Signorini's Tourniquet.

In emergency a tourniquet can be devised from a handkerchief tied around a limb and twisted tightly. A stone or block or pad may be placed inside and on the bleeding point.

TOWNS' TREATMENT.—See Lambert Treatment for Narcotic Addiction.

TOXALBUMIN.—A proteid substance resembling a ferment rather than a poison. Any of the poisonous albuminoids that are produced or separated from the albumin of the tissues by the agency of bacteria, and entering the circulation constitute the cause of the general symptoms of infectious diseases. Toxalbumins have been obtained from cultures of a number of bacteria—among others from those of diphtheria, typhoid fever, cholera, tetanus, glanders, tuberculosis, anthrax, and pneumonia; likewise, also, from cultures of the staphylococcus pyogenes aureus, and the swine-plague bacillus; from those of certain germs found by Booker in the stools of the summer diarrhea of infants, and from those of two toxicogenic germs isolated by Vaughan from drinking-water. It is possible that poisonous albuminous substances are also produced by animal parasitic organisms. Thus Viron has isolated a toxic proteid from the fluid of hydatid cysts.

TOXEMIA.—See Autointoxication, Gastritis (Toxic), Poisoning.

TOXICOLOGY.—See Poisoning.

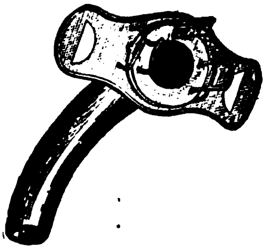
TRACHEA, INJURIES.—See Neck (Injuries).

TRACHELORRHAPHY.—See Cervix Uteri (Laceration).

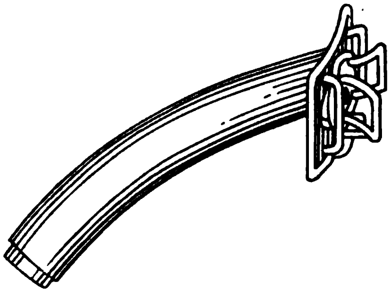
TRACHEOTOMY.—Tracheotomy is frequently required. It may be performed for the relief of obstruction, whether it is temporary (as in croup, diphtheria, edema of the glottis, or muscular spasm) or permanent (as in syphilitic stenosis); for the removal of foreign bodies; to give rest to the larynx in cases of painful ulceration; or as a precaution in operation in order to prevent the entry of blood.

The trachea may be opened either above or below the isthmus of the thyroid; but, unless there is some special indication to the contrary, the former should always be selected. The anterior jugular and inferior thyroid veins are in close relation with the lower part. The innominate artery bifurcates almost on it, and sometimes reaches far up into the neck. The thyroidea ima may cross it. It lies very much further from the surface and is much more easily displaced to one side. In infants, too, the thymus may cause a certain amount of difficulty.

The high operation, the only one that will be described here, may be done either with or without an anesthetic. Chloroform should, as a rule, be given to children, as otherwise their struggles are likely to embarrass the operator. In adults, however, it is not necessary as after the skin incision has been made no pain is felt, and chloroform is liable to increase the dyspnea, if present, to a dangerous extent, and necessitates the operation being rapidly performed; whereas the more deliberately it can be done, the less are the risks attending it. A small pillow having been placed beneath the neck as so to render it prominent, make an incision from the cricoid cartilage, exactly in the middle line, for from 1 1/2 to 2 inches downward, according to the age of the patient, fatness of the neck, etc. Divide the skin and superficial fascia, and, having found the interval between the sternohyoid muscles, continue the incision between them, carefully avoiding any large veins. The isthmus of the thyroid will now be seen in the lower part of the wound as a bluish-red body, and if sufficient room does not exist between it and the cricoid cartilage, draw it down gently with a blunt hook; or if this cannot be done readily, notch it in the middle line or divide it. The drawing downward of the isthmus is greatly facilitated by dividing transversely on the cricoid the layer of fascia, which extends from the cricoid cartilage to the isthmus. By doing this, moreover, the wounding of the veins between the layers of fascia will be avoided. The first 2 or 3 rings of the trachea having now been fully exposed, and all arterial hemorrhage arrested by ligature or pressure forceps, thrust the sharp hook into the trachea immediately below the cricoid cartilage, and, steadying it in this way, divide the first 2 or 3 rings by thrusting in the knife with the back of the blade directed downward and by cutting toward the cricoid. Venous hemorrhage, except from a large vein, which, of course, should be tied or clamped, need not delay the opening of the trachea, as it depends on engorgement of the right side of the heart, and will disappear after 2 or 3 inspirations through the tracheal wound. The wound in the trachea being held open by the tracheal dilator, pass the outer tube, made wedge-shaped by pressing it between the finger and thumb, into the trachea, and then immediately insert the inner cannula, as until this is done air cannot pass freely through the tube. Secure the tube *in situ* by tracheotomy tapes tied behind the neck. When the operation is performed for croup or diphtheria, the tube should not, as a rule be inserted at once, but the wound held open by the dilator, and any false membrane removed by a feather passed both down into the trachea and up into the larynx, or if this does not succeed, by a Parker's suction-tube apparatus. The bivalve cannula in general use is likely, on account of its shape, to produce ulceration of the anterior wall of the trachea, on which, from its curve, it must necessarily impinge; it has even been known to perforate the wall and to enter the innominate artery. This can be prevented by the improved shaped cannula invented by Parker. Should the breathing cease during the operation, the treachea should still be opened, the obstructing membranes removed, and artificial respiration persevered in for some time.



TRACHEOTOMY TUBE.



PARKER'S TRACHEOTOMY CANNULA.

Dangers and Difficulties of the Operation.—When the operation can be done deliberately, and on a patient with a thin neck, it is attended with no great difficulty; but when, as is frequently the case, it must be undertaken in an emergency, possibly with insufficient light and with no skilled assistant at hand, or on a young child or infant with a fat neck, and must be completed rapidly to prevent death from suffocation, it is perhaps one of the most trying that the surgeon is called upon to perform. The dangers into which the inexperienced and unwary may then fall are the following.

1. *The hyoid bone or the thyroid cartilage* may be mistaken for the cricoid cartilage, and the incision made through the thyrohyoid membrane or into the thyroid cartilage. This mistake could hardly occur except in a fat-necked child, and then only through carelessness in not determining the position of the cricoid cartilage before beginning the operation.

2. *The interval between the sternohyoid muscle may be missed*, and the dissection carried to one or other side of the trachea. The thyroid body and even the carotid artery has in this way been wounded. To avoid such a disaster the head should be held perfectly straight and the incision made accurately in the middle line; one side of the wound should not be retracted more than the other; and the index-finger should be used from time to time to make sure that the dissection is being made over the trachea.

3. *Too short an incision may be made*, and consequently be a source of embarrassment in drawing down the thyroid isthmus, and in defining the trachea before it is opened. The incision should never be less than 1 1/2 inches long, even in a child.

4. *One or more large veins may be wounded*, and the steps of the operation be considerably impeded by hemorrhage. Their walls are very thin; great care, therefore, is necessary to avoid injuring them.

5. *The knife may perforate the posterior wall of the trachea* and enter the esophagus. Caution, therefore, is necessary, and some advise that the knife should be held, while incising the trachea, with the forefinger placed on one side, 1/2 of an inch from its point, so that it cannot penetrate too deeply.

6. *The knife may slip to one side* instead of entering the trachea. This can hardly happen if the trachea is fixed by the sharp hook and drawn

well forward into the wound while being perforated.

7. *The innominate vein and even the innominate artery have been wounded* in incising the trachea during the performance of the low operation. The knife, therefore, should be introduced with the back of the blade toward the sternum, and the incision made from below upward.

8. *Blood may enter the trachea,* and if allowed to remain there, will coagulate, and the clots being drawn into the bronchi and acting as plugs may cause suffocation. This danger should be guarded against by tying all bleeding vessels, and thoroughly exposing the trachea before incising it, lest there should be a vessel in front of it. Should only a little blood enter the trachea, it can be coughed up; but if the amount is large, the patient should be turned on his side, and the head depressed, the wound of course being held open by retractors, to allow the blood to run out; or if this does not suffice, an attempt must be made to remove it by suction. When there is a general oozing of blood from the wound, the introduction of the tube will prevent more escaping into the trachea.

9. *The tracheotomy tube may be forced between the fascia and the front wall of the trachea; or one valve of the tube may be passed inside the trachea and the other outside.* To escape these accidents, the incision in the trachea should be free, and its edges well retracted, or one edge may be held up by a sharp hook. To insure both valves entering the trachea, they should be pressed well together; this may be conveniently done by Sankey's forceps.

10. *The tube, when a membrane is present, may be passed between the tracheal wall and the false membrane,* a danger that may be guarded against by removing the membrane before introducing the tube.

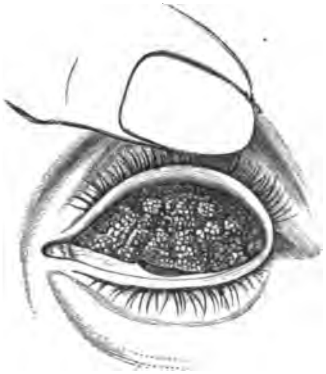
11. *The tube has been passed upward into the larynx instead of downward into the trachea.* No excuse and, it is to be feared, no remedy is to be found for such gross ignorance (Walsham).

After-treatment.—In the simplest case—chronic laryngeal stenosis, for instance, in which there is no pulmonary complication—all that is needed, provided the tube fits, is something to warm and moisten the air before it enters the lungs, and a dry absorbent dressing around the orifice to diminish the amount of discharge and lessen the risk of bronchopneumonia and cellulitis. The patient should be kept as quiet as possible in a semirecumbent position, and well protected from drafts. A bronchitis kettle may be used, but it is better, for a time, at least, to protect the orifice with a thin, flat sponge, wrung out of hot water, so as to filter the air thoroughly. The wound should be powdered with iodoform, and the flanges of the cannula prevented from pressing upon it by little pads of absorbent wool. The frequency with which the tube requires changing depends upon the amount of irritation it causes; a rubber one can often be introduced on a proper dilator by a second day. In cases such as these there is very little of that tenacious mucus that is so troublesome in croup or diphtheria. For the first few days the patient should be fed through the rectum; the movements of the trachea in swallowing are very painful (cocain sprayed over the wound prevents this to some extent), and there is great risk of fluid trickling down the larynx and passing by the side of the tube into the lungs. This may happen even after the cannula has been removed, if the larynx has not thoroughly recovered; but usually there is no danger after the wound has healed and the patient has grown accustomed to the change of respiration and learned how to cough. If the rectum becomes irritable or thirst is distressing, an esophageal tube should be used instead. Tracheotomy tubes, if worn permanently, should be frequently changed and carefully inspected from time to time. Their duration of life varies very much, and instances have been known of their breaking and of the end falling down into the bronchi. It is always well to protect the orifice with a suitable respirator.

In diphtheria the after-treatment requires even greater care. The air must be warmed and moistened, and the cot surrounded by screens, but the top should be left open. The tube must be kept clean by means of feathers dipped in a solution of bicarbonate of sodium or potassium, and if there is any membrane discovered floating in the trachea or larynx, it must be cleared away in the same manner. Parker recommends that the solution should be sprayed from time to time over the wound to prevent the viscid mucus collecting and drying around the orifice. The frequency with which the inner cannula requires changing depends upon the success with which this is carried out. At first it may need it almost every hour, but it must be remembered that the process is an exhausting one, and, for a time, very alarming to a child, so that every endeavor must be made to keep the passage free without. Each cannula should have a double set of inner tubes, so that when one is removed and a feather has been passed down the outer to make sure it is clear, the second can be introduced without delay. The outer need only be removed once a day. To clear them they should be placed in a hot solution of soda, and well scrubbed. The time the tube should be retained depends upon the course of the disease; but, in any case, the metal cannula should be replaced as soon as possible by a rubber one (it can usually be done by the third or fourth day), and this should not be worn longer than is absolutely necessary. Before discarding it an attempt must be made to educate the larynx again, and to reduce the amount of air passing through the tube, by using one that is perforated on the convexity or very much shortened. The child, of course, must be watched night and day by some one who can use dilating forceps and replace the cannula at once if there is any real danger.

Prognosis.—Care must be taken to distinguish between the consequences of the operation and those of the disease for which it is performed. Much depends upon the age of the patient; in an infant it is always serious, the structures involved are so small and delicate, and there is such great risk of pulmonary complications, independently of croup or diphtheria. If the lungs are already collapsed and partially consolidated, if the patient is exhausted by prolonged battling against imminent asphyxia, or if he is dying from the diptheritic poison, the operation can do no good, and tracheotomy must not be blamed for the result, for it may hasten the end. If it is to be of any real service, or if the wound is to be used not merely to relieve a symptom but to attack the disease by removing false membrane and giving the patient pure air—not that which has been befouled by passing over a poisoned surface—it must be performed while there is still a reasonable hope. See Laryngotomy.

TRACHOMA (Granular Lids).—A disease of the conjunctiva, characterized by the unrestricted formation of follicles which, instead of being absorbed as in follicular conjunctivitis, produce permanent granular masses, spreading over the surface of the entire lid, and presenting, in extreme cases, the characteristic appearance of a bunch of grapes of a deep red color. The upper lid is generally first affected. When the follicles are abundant, the conjunctiva is destroyed. Ulceration takes place, and the necrosed membrane is replaced by scar tissue. The disease is chronic, and progresses many years, new nodules forming while others are ulcerating and cicatrizing. The bulbar conjunctiva is not usually involved.



Trachoma.

Course.—The disease begins with conjunctivitis, followed by follicular formation and growth of vascular tissue over the cornea, due to friction of the roughened lid, causing keratitis and consequent corneal opacity. The upper third of the cornea is most affected, and there is a distinct line of demarcation between the healthy cornea and the vascular tissue, which never entirely disappears. This condition is called **pannus**, and is fully considered under diseases of the cornea. The second stage of trachoma is ulceration of the follicles. The secretion, until now slight, becomes mucopurulent, and the follicles, instead of being distinct, have a ragged appearance, and are ulcerated. The entire conjunctiva is congested, and the lashes are matted together with the secretion. After some months the disease passes into the third stage—**cicatrization.** The granulations have now disappeared, there is little secretion, and the conjunctiva is no longer actively inflamed and rough, but is dry and dirty-white, thickened, and rolled into fine folds. This atrophic condition is called **parenchymatous xerosis.** The entire lid is now shorter from above downward, so that the lids when closed gape to a slight degree, and are turned in. The lashes are sparse and irregular, and trichiasis results. Running parallel to the under surface of the upper lid and 2 mm. from it a thick scar is sometimes seen.

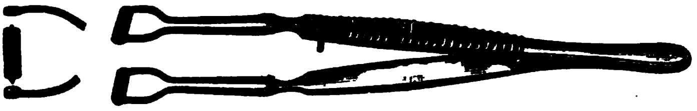
The subjective symptoms in the first stage are pain, itching and burning of the lids, lacrimation, photophobia, and asthenopia. Later on there is dimness of vision, which increases in the third stage. There are also the annoying symptoms caused by the inverted lashes.

Cause and Distribution.—Poorly nourished and scrofulous persons are most frequently affected. Unhygienic habits and contagion in crowded districts are marked factors in the production of the disease. Trachoma is rare in mountainous regions and increases toward the lowlands. The peculiar susceptibility of some of the Continental emigrants is possibly due to their unsanitary habits, rather than to any inherent racial peculiarity of temperament. According to Burnett and others, negroes are particularly immune from trachoma.

There is unanimity of opinion as to the infectiousness of trachoma, and, although there is an inclination to consider the disease as due to a special organism, the reports of bacteriologic investigation have not been harmonious. The trachoma bodies of Prowazek-Greeff, almost always found in the acute stages of trachoma and absent if the condition is not trachoma, have apparently the best claim to specificity. These bodies or granules are found inside the cells and, when stained by the Giemsa method (on a blue field) resemble tiny red cocci, though they are considered by the investigators to be protozoa. They seem to group themselves near one margin of the cell nucleus.

Prognosis is unfavorable. The disease continues for many years, and there is rarely complete recovery. The dryness of the conjunctiva is very annoying, and by the irritation and exposure of the corneal epithelium, with consequent opacity, vision is affected. Entropion and trichiasis are disagreeable sequels.

Treatment.—The patient should be informed of the infectious nature of the disease, and warned not to wipe his eyes on public towels. To the strumous and poorly nourished, change of environment and constitutional treatment are of great value. The conjunctival sac should be washed several times a day with boric acid or a weak solution (1:8000) of mercuric chlorid. If the symptoms are acute, the temples should be leeched, cold applications instituted and atropin instilled. As the inflammatory symptoms subside, a 50 percent solution of boroglycerid in glycerin should be applied twice daily. It may be alternated with glycerol of tannin or copper sulphate, or alum in pencil form. Prolonged application of silver nitrate leaves distressing scars and discolors the conjunctiva, and is not advised. Those who derive good results from this salt use it with great care, and only after long experience. Boroglycerid is more efficacious and can be given to the patient to drop in the eye at home during the intervals of visits to the physican's office. There is diversity of opinion relative to the value of protargol in this affection. Its use has not been followed by good results. Mercuric chlorid in solution of 1:250 may be brushed over the everted lids. Operations destroying much conjunctiva defeat their own purpose, as the previous destruction of this membrane by the disease is already the cause of many disagreeable complications. In cases in which the granulations are very profuse and have not yet ulcerated, the disastrous sequels may be averted by expression. A favorite method consists of squeezing the granulations with roller forceps, but it is not advised as a routine practice. Tension may be relieved by splitting the external canthus and cutting the canthal ligament. Hyperemic and soft granules must be more carefully handled. Massage with iodoform ointment may be used, and is less painful to the patient, and often gives good results in a very short time. Pannus should be treated by massage, peritomy, or jequirity inoculation. See Cornea (Diseases). Distortion of the lids must be corrected and corneal opacities treated. Constant instillations of glycerin or some bland oil are said to be palliative in xerosis.



Knapp's Roller Forceps.

TRAGACANTH.—The exudation of several species of *Astragalus*. A natural mixture of gum arabic and bassorin. A demulcent employed mainly as a vehicle for resins and insoluble powders. It is a constituent of 7 of the 9 official troches, and is a better agent than acacia for making emulsions of cod-liver oil. T., **Mucilago,** tragacanth 6, glycerin 18, water to 100 parts. Dose, 1/2 ounce or more.

TRANCE.—A form of catalepsy, characterized by a prolonged condition of abnormal sleep, in which the vital functions are reduced to a minimum, and from which the patients ordinarily cannot be aroused. The breathing is almost imperceptible, and sensation is abolished. The onset and awakening are both very sudden.

Etiology.—Common trance occurs principally among females between 12 and 30 years of age; and the subjects are seldom in perfect health. Various hysteric manifestations are seen, and anemia often exists. Trance has been due to exhausting diseases, as typhoid fever and influenza; to excessive brain-work, or to mechanic obstruction to the circulation of the brain.

Symptoms.—During a trance the subject is usually pale, the limbs are relaxed, the eyelids closed, and the eyeballs directed upward, deviating, and sometimes diverging, from the middle line. The mental functions are in complete abeyance. The pallor of the face is the result of profound depression of the vascular system. The duration of trance may be from a few hours to weeks, months, or even a year. The postmortem examinations of persons who have died in trance throw no light on its nature.

The diagnosis must be made from apoplexy, coma, and death. The presence of life may be determined (1) by the absence of any sign of decomposition, (2) by the normal appearance of the fundus of the eye as seen with the ophthalmoscope; and (3) by the persistence of the electric excitability of the muscles. This excitability disappears 3 hours after death. See Coma.

Treatment.—Food may be given by the nasal tube, or by enema. Warmth should be applied to the extremities, and the development of bed-sores prevented. Strong faradization is the most powerful cutaneous excitant. Nerve stimulants, such as ether or valerian, may be given by the bowel. Alcohol must be given with caution and in small quantities. Strong-coffee enemata are often more useful. Recurrence of attacks may be prevented by the improvement of health, physical and moral.

TRANSFUSION.—The operation of the transfusion of blood is not without dangers, and offers no advantages over the infusion of saline solutions either beneath the skin or intravenously. See, therefore, Infusion. The indications and modus operandi of transfusion are as follows:

The indications for transfusion are certain cases of violent hemorrhage.

Methods.—There are two methods of transfusion—(1) direct transfusion, (2) indirect transfusion.

In the **direct method** blood from an animal is conveyed, by means of a specially devised apparatus, directly from one person or one animal to that of another. According to the **indirect method,** the blood is first withdrawn, and afterward injected into the vein of another.

The direct method is preferable, and is the one generally used. Aveling's apparatus is recommended. The operation as described by Wharton is as follows: The bulb and tube are first placed in a shallow basin containing warm normal saline solution (0.7 percent) and the bulb and tube are filled with this solution to displace any air that they contain. The person supplying the blood places his arm near the arm of the patient, and the operator exposes a prominent vein on the patient's arm at the bend of the elbow, opens it, and inserts into it one of the cannulas filled with saline solution, with the point directed toward the body, and at the same time an assistant introduces the other cannula into a vein at the bend of the elbow of the one who supplies the blood. The cannulas are held in position by assistants, and the tube is quickly connected with them—the stop-cocks being closed before it is taken out of the saline solution to prevent the entrance of air; then upon opening the stop-cocks a direct communication is established between the circulation and the donor.

By slowly compressing the bulb (at the same time keeping the tube closed on the side of the donor) the blood is forced into the circulation of the patient. The wounds should be subsequently dressed antiseptically.

Crile's method of arteriovenous anastomosis is described by Da Costa as follows: The vascular system of the donor is united to the vascular system of the recipient, intima being connected to intima. This is accomplished by means of a German silver tube. The vein of the recipient is drawn through the tube, is everted, and is tied into the second groove of the tube.

The end of the tube with the everted vessel over it is passed into the vein of the recipient and fixed temporarily by a ligature. The left arm of each subject is usually employed and the radial artery of the donor is anastomosed to a superficial vein of the recipient. Every small branch over the artery is carefully tied in order to prevent obscuration by blood. The artery is bared for a distance of about 3 cm., tied distally, lightly clamped with a screw clamp proximally, and divided. The vein of the recipient is bared, clamped, and divided, the tube (dipped in sterile olive oil) is inserted into the vein, the cuff of everted vessel is formed over the end, and the artery is pulled over the tube and cuff of vein and held by a ligature tied into the first groove.

Indirect Transfusion of Blood.—According to this method blood is withdrawn from the vein of the donor by venesection, and is received in a clean glass or porcelain vessel, which is placed in water at a temperature of 110° F. It is defibrinated by whipping with a bundle of straws, and is passed through fine linen; it is then injected by means of an ordinary syringe attached to a cannula which has been previously inserted into a vein of the patient. Care should be exercised to prevent air from being introduced with the blood. The apparatus devised by Allen and modified by Hunter is the one most frequently used. See INFUSION.

Autotransfusion.—The driving of the blood from the periphery to the center—the heart and the brain—in order to maintain the circulation, as in bandaging of the limbs in postpartum hemorrhage.

Reciprocal transfusion is the exchange of equal volumes of blood between a patient suffering from a febrile disease and one who is convalescent from that disease, the blood of the latter being supposed to contain an antitoxin.

TRAUMATIC FEVER.—See ASEPTIC FEVER.

TREMOR.—An involuntary trembling or agitation of the body or of some of its parts. Tremors are seen principally in the arms, head, hands, tongue, or facial muscles. They are *coarse* or *fine*, according to the amount of movement involved. They are *passive or static* when they are present during rest; if produced or increased by voluntary movements they are called movement or *intention tremors*, and are suggestive of disseminated sclerosis, lead poisoning and senility. In addition they may be local or general, rapid or slow, regular or irregular.

Etiology.—Tremor is often observed as one of the nervous phenomena of chronic alcoholism and delirium tremens and is generally observed in acute poisoning by lead, mercury, arsenic, and in chronic poisoning by chloral and by opium. It is a symptom of paralysis agitans, invariably present, and appears in association with both paralysis and contracture, and it is found in hysteric subjects. It attacks the aged, chiefly in the arms and head. *Simple tremor* often occurs without assignable cause, sometimes occurring as the result of emotions, such as fright. It is commonly present in debility, *asthenic tremor*, and passes off as strength is regained. In acute disease, such as typhoid fever, tremor indicates a profound toxemia.

Diagnosis.—In order to ascertain whether the tremor be passive or intention, the patient is observed as he performs some voluntary act, such as drinking a glass of water—an intention tremor will be markedly accentuated. Any tremor of the extremities is exaggerated by extension. The tremor in **disseminated sclerosis** is irregular, and the movements are sudden and jerky and much increased by voluntary efforts at restraint. They are absent during rest, but occur upon movement. In **paralysis agitans** the tremor is regular and rhythmic, and, save early in the progress of the disease, occurs during both rest and movement. **Senile tremor** occurs at first only on movement, and during rest almost or entirely ceases. When severe, it may occur both in movement and in rest. It is more influenced by movement than is the tremor of paralysis agitans.

The movements in senile tremor are exceedingly fine, beginning in the hands and often extending to the muscles of the neck, causing slight movement of the head. Alcoholic tremor occurs only during movement, and chiefly affects the tongue, hands, arms, and face. *Toxic tremors* may also be seen in elderly men who are persistent smokers, and they may result from excessive use of tea and coffee, or from drug habituations. There is a peculiar form of tremor observed among smelters and others exposed to the fumes of mercury. It is sudden or gradual in onset, and is usually accompanied by salivation. The arms are first involved, and then the entire muscular system. If allowed to go on, paralysis, mania, and idiocy may result.

The tremor of *exophthalmic goiter* is similar to the toxic tremors. It is fine and rapid and is elicited by the extreme extension of the fingers.

Fibrillary twitchings of the facial muscles may be induced by chronic alcoholism, paresis or profound neurasthenia. It occurs in other regions, as well in progressive muscular atrophy. See BLEPHAROSPASM.

Closely allied to tremors are choreiform movements. See CHOREA.

Treatment.—This will depend upon the causal condition. Little result from treatment can be expected. Nerve tonics and sedatives may be tried in simple and senile tremors.

TREPHINING.—See SKULL (Surgery).

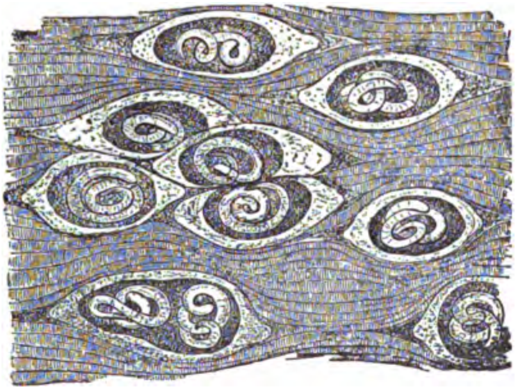
TRICHIASIS.—See EYELIDS.

TRICHINIASIS (Trichinosis).—A disease produced by the ingestion of meat, pork, or sausage containing the trichina spiralis. The parasites lie coiled up in capsules between the muscular fibers of the meat. After their entrance into the human body their presence gives rise to nausea, vertigo, fever, diarrhea, prostration, stiffness and painful swelling of the muscles, edema of the face, and in some cases perspiration, insomnia, delirium, and death from exhaustion or some complication, as pneumonia. The blood always shows an eosinophilia. The stages of the disease are the *intestinal stage*, *migration stage*, and *encapsulation stage*.

The parasite is found in two forms—intestinal trichina, which is sexually mature, and muscle trichina, which is sexually immature.

The intestinal trichina is a small, hair-like worm, the male measuring 1/18 inch, and the female 1/8 of an inch in length; the head is smaller than the rest of the body; the tail of the male has a bilobed prominence, between the divisions of which the anal opening is placed, and from which a single spiculum can be protruded; the female has a blunt, rounded tail, the reproductive outlet being situated toward the anterior part of the body; the ova are very small, containing embryos that are produced viviparously at the rate of at least 100 each week after the entrance of the female into the intestinal canal.

The muscle trichina develops its sexual apparatus after it has entered the intestinal canal of the host. The viable embryos discharged from the female are in a state of motion, and at once migrate from the intestines to the muscular structure of the individual, and here set up inflammatory action; they becoming surrounded by a capsule or shell in which they are coiled. After a time, in the muscle, the trichina undergoes a further change: lime salts are deposited in and about the capsule and in the parasite itself, and minute specks of lime are seen distributed throughout the muscular structure. The development of the parasite from the period of the impregnation up to the time of sexual maturity is, under favorable conditions, less than 3 weeks. Within 2 days from the ingestion of the infected pork occurs the maturation of the muscle larvæ; in 6 days more the birth of embryos occurs, and in about 2 weeks the migrating progeny have arrived at their habitat, the muscular structure.



Trichina Spiralis.—(*Ziegler.*)

The prognosis depends upon the amount of infection in the pork or beef. Mortality is between 20 and 50 percent.

Treatment.—The preventive treatment consists in eating no pork that has not been so prepared as to kill any trichinæ that might exist. If the parasites have been recently taken—within the first 4 or 5 days—emetics and purgatives to remove them from the stomach and intestinal canal are indicated. After thorough action from these, attempts may be made to destroy such of the parasites as have escaped the action of the emetic or purgative. For this purpose glycerin 1 part, water 2 parts, is much in favor; or a trial can be made of carbolic acid and tincture of iodin, as suggested by Bartholow. Quinin has given good results.

After migration has begun, the vital powers should be sustained by nourishing food, stimulants, and tonics, as there are no drugs that have any influence upon the embryos in their migration through the muscles.

TRICHLORACETIC ACID.—A monobasic organic acid ($CCl_3.COOH$) obtained from the oxidation of chloral hydrate with nitric acid. It should be kept in dark well-stoppered bottles in a cool place. While penetrating deeply it does not cause as much pain as many other escharotics. It is used locally in lupus, condylomata, etc., and for cauterization of the nose or throat.

TRICHOPATHY (Trichosis).—Any morbid affection of the hair. See Alopecia, Canities, Hirsuties.

TRICHOPHYTOSIS.—See Ringworm of the Scalp.

TRICRESOL.—A mixture of the three isomeric cresols, respectively named the ortho-, meta-, and paramethyl phenols; it also contains the hydroxyl group, which seems to be a characteristic constituent of antiseptics and germicides. It occurs as a white liquid of creosote-like odor (sp. gr. 1.052 to 1.049), and is soluble in water. Tricresol possesses very high germicidal power, and is said to be practically nontoxic, and less irritating to wounds than either carbolic or sublimate solutions. A 1:1000 solution dropped into the eye produced not the slightest irritation. Such solutions may, therefore, be advantageously employed as menstrua for the stock collyria, especially for those of cocain, physostigmin, and atropin, which are most liable to contamination. Tricresol is particularly fatal to pyogenic cocci, a 1 percent solution invariably killing them in 1/2 minute in watery solutions, and in 1 1/2 minutes in rich albuminous fluids (Grüber). See Phenol.

TRIFACIAL NERVE, AFFECTIONS.—This important mixed nerve of the face supplies, by its motor trunk, the muscles of mastication; by its sensory portion, the skin of the face, the mucous membrane of the mouth and nasal cavity, the conjunctiva and cornea, also the anterior part of the tongue with gustatory fibers. The gustatory fibers reach the lingual fibers of the fifth by the chorda tympani nerve.

Lesions.—1. There may be lesions of the pons, especially hemorrhage, or spots of sclerosis invading the trigeminal nucleus.

2. Injury or disease at the base of the skull, especially acute and chronic meningitis and caries of the bone; tumor; syphilis; new formations compressing the trunk or Gasserian ganglion. Fracture of the base rarely affects this nerve.

3. Tumors or aneurysms pressing on the first division (ophthalmic) of the nerve through the cavernous sinus, on the second division (superior maxillary) and on the third division (inferior maxillary) by invasion of the sphenomaxillary fossa.

4. There may be inflammation of the nerve, which is rare.

The sensory division may also be affected in hysteria and in lesions of the posterior part of the internal capsule. The gustatory fibers of the trigeminus may be influenced by peripheral lesions of the facial nerve, from which the chorda tympani is derived.

Symptoms. Paralysis of the Sensory Portion.—The distribution of the anesthesia varies according as the whole trigeminus or only a half is involved. In total anesthesia there is loss of sensation in half the corresponding side of the head, including the conjunctiva and cornea, mucosa of the lips, tongue, hard and soft palates, and nose of the same side. Hence on the tongue or mucous membranes there are often ulcers that come from unconscious laceration by the teeth. There is loss of taste and impairment of smell. The muscles of the face are also insensible, hence their movements are slower. The so-called trophic phenomena are also observed, and among them the much-discussed *neuroparalytic ophthalmia*, an ulcerative keratitis, beginning, always in the lower segment of the cornea, and passing over into purulent inflammation of the whole eyeball. It seems, on the whole, more likely that the inflammation is primarily due to the action of irritants that in health are excluded by the proper closure of the eyelids, though the inflammatory process itself may be trophically influenced. The salivary, lacrimal, and buccal secretions may be diminished, and the teeth may become loose. Herpes is a trophic result that may develop in the course of the nerve, is painful, and may last a long time. So, too, the anesthesia may be preceded by tingling. The skin of the face is sometimes swollen.

Paralysis of the motor portion, which supplies especially the muscles of mastication, the masseters, temporals, and pterygoids, is not common. It is most frequent in diseases of the base of the skull, compressing this branch. Difficulty in chewing is the result. If on one side, the patient can only chew on the other; if on both sides, he cannot chew at all. The lower jaw hangs down and cannot be moved from side to side because of the paralysis of the pterygoids. If on one side, the external pterygoid cannot push the jaw toward the sound side; and when depressed, the jaw is pushed by the muscle of the sound side toward the paralyzed side. Cases have occurred associated with cortical lesion; from one of these Hirt inferred that the motor center for the trigeminus is in the neighborhood of the lower third of the ascending convolution.

Spasm of the muscles of mastication occurs in connection with muscular cramp, the muscular contraction of tetanus (trismus), sometimes in tetany and meningitis, and reflexly through painful affections of the jaw or teeth, or from irritation near the motor nucleus. It is at times hysteric. Clonic spasm occurs in muscles supplied by the fifth nerve, constituting "chattering teeth." It occurs usually in connection with general conditions, such as chorea, but it may arise as a local symptom in women late in life (Tyson).

Diagnosis is not difficult. Sensibility is tested in the ordinary way. The preliminary pain must not be mistaken for neuralgia. Gustatory sense is tested in the anterior end of the tongue by applying weak acid or salt solutions and comparing the effect on the two halves. The motor power is tested by biting on a piece of wood or by moving the jaws against resistance.

Treatment must depend upon the cause, which should be carefully sought. Syphilitic new formations are the lesions most commonly amenable to treatment. In the absence of such causes the treatment must be symptomatic. Stimulating liniments and faradization through the electric brush are often useful. Galvanism may also be used, brushing the part with the kathode. The anesthetic part should be carefully protected against irritants.

TRIGEMINAL NERVE.—See TRIFACIAL NERVE.

TRIONAL.—A name applied to sulphonethylmethane. Diethylsulphonethylmethyl methane. A disulphone belonging to the ethyl and methyl groups; in ordinary doses it is harmless, and possesses marked hypnotic properties. It is a powder consisting of shining tablets, with a melting-point of 76° C., and which dissolve in 320 parts of water at ordinary temperature, readily in alcohol and ether, and have a distinctly bitter taste. Trional is also soluble in paraldehyd, and the association of these drugs produces a powerful hypnotic. Trional is administered in fine powder dissolved in liberal quantities of some liquid. Dose, 10 to 30 grains daily. Trional differs from sulphonal only in the substitution of an ethyl for a methyl group. It is an efficient hypnotic, and is less liable to produce ill effects than sulphonal, but must be given in doses fully as large. In cases of slight psychic excitement accompanied by obstinate insomnia it is peculiarly efficient. In conjunction with phenacetin or acetanilid it is useful to procure sleep when pain is present. See LAMBERT TREATMENT FOR NARCOTIC ADDICTION.

TRIPHENIN.—Propionyl-phenetidin. Being less soluble than phenacetin it is milder and slower in its action. It is said to produce no unpleasant effects. Dose, as an antipyretic, 4 to 10 grains; as an antineuralgic, 15 to 20 grains.

TRITICUM (Couch-grass).—The dried rhizome of *Agropyron repens*. It is emollient, diuretic, and antiphlogistic. It is best administered in a decoction made from 2 to 4 ounces of the plant in 2 pints of water, and reduced one-half by boiling. It is demulcent, emollient, and feebly diuretic, and is useful in cystitis and in irritable bladder. The dose of triticin is from 1 dram to 1 ounce in infusion.

The dose of the fluid extract is from 1 dram to 1 ounce, well diluted.

TRITURATIONS.—A class of powders having for their diluent sugar of milk, and possessing a definite relation between the active ingredient and the diluent. The Pharmacopeia prescribes a general formula for these preparations, according to which 10 grams of the substance and 90 of sugar of milk are to be well mixed by a spatula, the latter being added in successive quantities, and both triturated in a mortar until the substance is intimately mixed with the diluent and finely comminuted. There is but one official trituration (trituratio elaterini), though the pulvis ipecacuanhæ et opii practically belongs to this class. Sugar of milk is employed as the diluent because of its hardness and its comparative insolubility.

TROCHES (Trochisci).—Also called *Lozenges*, and *Pastilles*. Small, flattened cakes of medicinal substances prepared from a mass consisting chiefly of medicinal powders, sugar, and mucilage. There are 9 official troches:

Title.	Constituents—100 Troches.	Each Troche Contains:
Trochisci:		
Acidi tannici..	Tannic acid, 6 gm.; powdered sugar, 65 gm.; powdered tragacanth, 2 gm.; stronger orange flower water, a sufficient quantity.	Tannic acid, 1 grain.
Ammonii chloridi.	Ammonium chlorid, 10 gm.; extract of liquorice, 20 gm.; powdered tragacanth, 2 gm.; powdered sugar, 40 gm.; syrup of tolu, a sufficient quantity.	Ammonium chlorid, 2 grains.
Cubebæ........	Oleoresin of cubeb, 2 gm.; oil of sassafras, 1 c.c.; extract of liquorice, 25 gm.; powdered acacia, 12 gm.; syrup of tolu, a sufficient quantity.	Oleoresin cubeb, ⅓ grain.
Gambir........	Gambir, powdered, 6 gm.; powdered sugar, 65 gm.; powdered tragacanth, 2 gm.; stronger orange flower water, a sufficient quantity	Gambir, 1 grain.
Glycyrrhizæ et opii.	Extract of liquorice, 15 gm.; powdered opium, 0.5 gm.; powdered acacia, 12 gm.; powdered sugar, 20 gm.; oil of anise, 0.2 c.c.; water, a sufficient quantity.	Powdered opium, 1/12 grain.
Krameriæ......	Extract of krameria, 6 gm.; powdered sugar, 65 gm.; powdered tragacanth, 2 gm.; stronger orange flower water, a sufficient quantity.	Extract of krameria, 1 grain.
Potassii chloratis.	Potassium chlorate, 15 gm.; powdered sugar, 60 gm.; powdered tragacanth, 3 gm.; water, a sufficient quantity.	Potassium chlorate, ¼ grain.
Santonini......	Santonin, 3 gm.; powdered sugar, 90 gm.; powdered tragacanth, 3 gm.; stronger orange flower water, a sufficient quantity.	Santonin, ½ grain.
Sodii bicarbonatis.	Sodium bicarbonate, 18 gm.; powdered sugar, 54 gm.; bruised nutmeg, 1 gm.; mucilage of tragacanth, a sufficient quantity.	Sodium bicarbonate, 3 grains.

TROPACOCAIN.—A powerful anesthetic and mydriatic, derived from a small-leaved coca of Java. It has the general qualities of cocain, but appears to be more active and much less toxic. The hydrochlorid is applied in 3 to 10 percent solution in 0.6 percent sodium chlorid solution. See Cocain.

TROPHIC DERANGEMENTS.—See Nervous Diseases (Examination).

TRUSS.—An instrument for maintaining a part in proper position in hernia or other malposition of organs.

Trusses should exert pressure sufficient to a little more than completely retain a hernia under all conditions and in all positions of the body. In reducible hernia continued use of a truss, particularly in young persons, may effect a cure. It is important that a truss should be fastened in position *before* rising in the morning and that it shall be removed *after* lying down at night. During the night a light or special truss may be worn, and also in bathing. When a portion of omentum constitutes the hernia, the gut being replaceable, it is very difficult to maintain reduction. A femoral hernia, is always more difficult to keep reduced than an inguinal hernia; and in fleshy persons adjusting a truss is troublesome.

Trusses are always uncomfortable at first, a feeling which is soon overcome. If a truss fits, it retains the hernia reduced even in sitting so that the abdominal walls are relaxed, and when coughing and straining occur. If pain results from the use of a truss, or it does not retain the hernia, it is harmful. A spring which is too strong will enlarge the hernial opening, and may aggravate the case. A truss should be worn for a long time after an apparent cure.

To measure for a truss (MacCormac's rule).—In either inguinal or femoral hernia the lower part of the hernial opening is the point of starting for measurement; thence measure up to the anterior superior spine of the ilium on the same side, thence around the body 1 inch below the crest of the ilium to the other or opposite anterior superior iliac spine, and then to the upper part of the hernial opening.

Trusses are composed of different materials **elastic** as steel or vulcanite, and **inelastic**, as leather, calico, or jean. The last kind does not exert sufficient pressure, but is sometimes of service in a large irreducible or umbilical hernia.

The pad is usually made of hard rubber, vulcanite, or xylonite, or of cork covered with flannel, linen, and wash-leather. Water- and air-cushions may be used, especially if the surface is painful or irregular. Boxwood, ebony, ivory, or other firm, nonabsorbable materials are sometimes employed. The pad for an inguinal hernia is pear-shaped, and about 3 inches long, 2 inches at its broadest part, and about 3/4 of an inch in thickness. The outer surface is flat, and has two studs for attachment of straps. The inner surface is convex, looking upward as well as backward—especially so when the abdomen is protuberant—and it lies upon the internal ring and the inguinal canal, and although not touching, may come quite close to the pubic spine. When the hernia is congenital, the so-called rat-tailed shape is usual. The pad is prolonged downward between the thigh and scrotum, gradually tapering off. A double truss is sometimes here preferable, particularly if the deformity is direct or is an old oblique hernia, the rings of which have been dragged nearly opposite to each other. A double truss is not more inconvenient than a single one.

The pad for an oblique inguinal hernia is sometimes cut like a horseshoe with one side (which covers the inner pillar) longer than the other. The rupture is prevented from descending by the tension across the opening. For a direct hernia this principle requires that the shape of the pad be that of a ring, the center of which corresponds with the axis of the hernial opening.

For femoral hernia the pad is smaller, and is beveled a little on the outer side, to avoid pressure upon the femoral vein, and is also beveled above, so that it may fit well under Poupart's ligament and bring the walls of the canal together.

A shallow concave plate is used for umbilical hernia, the truss at the same time supporting the lower parts of the abdomen. Nipple-shaped projections only enlarge the hernial openings.

As a rule, the pad is rigidly fastened to the spring, but a ball-and-socket joint is sometimes used, and in other trusses the pad may be shifted up or down and fastened in any position. The under-strap of a truss should always be fastened to the lower stud on the back of the pad, to prevent its riding up. It should be moderately tight when the patient is in the upright position.

To test a truss, the patient should sit on the edge of a chair, with the knees separated so that the structures around the ring are relaxed. He should then be directed to strain downward. If the rupture does not escape, the pad fits the opening and the pressure is sufficient. Too strong pressure tends to cause absorption of tissues beneath. If the skin beneath the truss or pad becomes sore or excoriated, it may be bathed in cologne water or alcohol to harden it, and dusted with violet powder.

An irreducible hernia may be inclosed in a hinge-cup made of rim-plate covered with leather, or may be supported in a laced bag-truss. Belts may be required for ventral or umbilical protrusions. For the congenital hernia of children a skein of Berlin wool may be used. For irreducible hernia in the aged a bag-truss, laced up on one side, or a cup made of soft leather supported by a metal rim, may be used. Sometimes the truss may be made of metal molded on a cast taken from the hernia while it is smallest. See Hernia.

TRYPANOSOMIASIS.—See Sleeping Sickness.

TRYPSIN.—The proteolytic enzyme of pancreatic juice. Its powers are manifested in an alkaline medium, converting proteids into peptones. Traces of trypsin are said to have been found in urine, but this is doubtful. It is recommended for spraying the throat in membranous or diphtheritic croup. Thirty grains are dissolved in 1 ounce of water, 10 grains of sodium bicarbonate are added, and the mixture is applied by means of a brush or as a spray.

TUBAL ABORTION.—Internal rupture of a tubal pregnancy, with extrusion of blood, and possibly of the ovum, through the fimbriated extremity of the tube into the abdominal cavity. See Extrauterine Pregnancy.

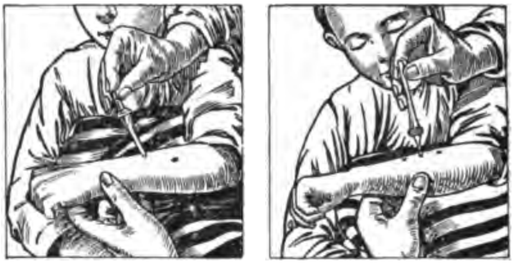
TUBAL PREGNANCY.—See Extrauterine Pregnancy.

TUBERCULIN.—Koch's lymph. A glycerin extract of cultures of the bacillus of tuberculosis. For a time tuberculin was thoroughly discredited. It has, however, become of interest again by reason of the efforts to extract from it a germicidal constituent free from toxins, also by the results obtained in tuberculosis with the blood serum of animals immunized by its repeated inoculation. It is extremely valuable in the diagnosis of tuberculosis in cattle and recently it has been gaining favor in the diagnosis of human tuberculosis. See Tuberculosis (Pulmonary).

Test.—A hypodermic injection of 1 to 10 mg. of pure tuberculin is given. "Reaction" consists in a rise of temperature of 1 1/2 to 2° F. within 12 hours after injection.

Modifications.—The opthalmo-reaction of Wolff-Eisner and Calmette. See Vaccine Therapy.

Cutaneous Reaction (of von **Pirquet). Technic.**—After the skin of the fore-arm has been scrubbed with ether, two drops of undiluted tuberculin are dropped on it about 4 inches distant from each other. Then with a special vaccination-lancet a superficial scarification is made between the two drops on the dry surface. Finally the same scarification is made inside of the two drops. A few fibers of cotton are put on the drops so that they will not flow. After five minutes the cotton is taken off, but no dressings are to be applied. The reaction is best examined after 48 hours. It is considered positive when the tuberculous scarifications are clearly different from the control place, but the ordinary reactive area must measure at least 1/6 of an inch.



Remarks on the Technic.—Scrubbing the skin with other substances than ether is not advisable, because if one applies a watery solution of an antiseptic character (or alcohol) the skin does not dry very quickly and so the drop of tuberculin runs, and is diluted; ether alone allows a very quick drying.

Old tuberculin in full strength has the advantage over diluted tuberculin in that no preparation is necessary, and that the substance keeps an indefinite time, as it contains a large amount of glycerin and some carbolic acid. The old tuberculin used is the extract of tubercle bacilli which was indicated by Koch in 1891. It is perhaps best to use the original preparation bought of Lucius and Bruning in Hoechst a/M, but similar preparations are also manufactured in America.

The special vaccination lancet, advised by v. Pirquet for this purpose differs from an ordinary one in the form of its tip, which is not pointed but has a crescent shape like a small chisel. This tip is made of platinum, so that it can be cleaned by exposing it to heat. The abrasions are not made as in vaccination, by scratching; but by turning the instrument quickly. As the point is about 1/12 of an inch, it gives a round abrasion of the same diameter. The turning should be made with a slight pressure, the intensity of which must vary with the quality of the skin. In small children very slight pressure is sufficient; in adults one must exert more. The abrasion should be quite superficial, taking off the epidermis only, and no blood should escape. The abrasion which is made first is used for the control of the traumatic redness. Each scratch on the skin causes a slight traumatic reaction, the intensity of which depends on the individual. It is therefore necessary to compare the tuberculin points with an ordinary scratch of the same size. One could apply for that purpose some fluid, such as physiologic salt solution or bouillon, but as it was proved that scratches with these different fluids show no more reaction than a scratch with no fluid, it is simpler to make it without the fluid. The fibers of cotton are only to be used if the drops are large. Pirquet usually allows them to fall from a dropper, but one can also do the following: The tuberculin is kept in a glass tube with a long glass stopper; the point of the lancet is moistened with the end of the glass stopper; in this way there is practically no drop left, and the cotton need not be used. The best moment of control is after 48 hours; but it is advisable to look at the points several times, say after one, two and seven days.

Description of the reaction.—(1) Traumatic reaction: The vaccination and control points show the same condition at first. Within a few minutes a hive-like appearance is noticed, with a slight red margin; this disappears after some hours. After 24 hours one finds in the control point a brown scab with a slight redness around it which disappears in 48 hours.

(2) Vaccination points with negative reaction act like the point of control, only at times they are a little bit more elevated. In case there is any doubt of a positive reaction, the vaccination is to be repeated.

(3) The positive reaction. (a) *Time of latency* (3 hours to several days). During the first hours no specific action of the tuberculin is noticed, but only the traumatic one. In most cases the reaction is in its full height in 24 to 48 hours. (b) *Growth.* The inflammatory reaction begins usually as a slightly elevated papule at the point of scarification, which increases in height and diameter; the final diameter of a positive reaction is on an average about 1/2 inch, but is sometimes one inch or more. There are also great individual differences in the exudation. If the papules are very large, the central part is also usually very elevated, with sometimes small serous blisters, or even one large blister on the top of it. The color too is very different; as a rule, strong individuals with a good general color of the skin show papules of intense redness, while anemic individuals show slightly colored reactions. Sometimes there is scarcely any hyperemia, and one notices the papule on palpation only. This is often the case in colored people. On the other hand, reactions may occur which consist only in redness, and show no exudation. This is especially the case in miliary tuberculosis or in tuberculous emaciation. The outlines of the papule are generally distinct, and circular in outline; but sometimes it shows irregular rays, which point in the direction of the lymphatic vessels. In cases of scrofulo-tuberculosis, one often finds very small papules near the reaction but not in direct connection with it. The hyperemia does not generally extend over the margin of the exudation; but in intense reactions one often meets after 48 hours a slightly reddened margin surrounding the central exudation, which margin may be even 2 inches in diameter. (c) *Reformation.*—Generally papules begin to decrease 48 hours after the vaccination. The redness at first changes to violet and then to a brownish color followed by pigmentation which may persist for a month or longer, whereas the exudation disappears within the first week. (d) *The Slow and Secondary Reaction.*—There are cases in which the positive reaction appears only after two, three, or six days. They have a somewhat different meaning from the early reaction, and are very nearly related to the cases of "secondary reaction," in which the positive issue of a second vaccination occurs five to ten days after the first one.

Other Actions of the Cutaneous Test.—In v. Pirquet's method of making only very superficial abrasions, a general reaction of the organism practically never occurs; a slight elevation of temperature being noted in about 1 percent of cases. However, minimal amounts of tuberculin certainly enter the general circulation, for we often see that the sensitiveness to tuberculin is increased after a vaccination. The cutaneous reaction has practically no contraindication. One can use it at every age and in spite of every degree of fever.

Histologic Findings.—The inflammation of the cutis shows a tuberculous inflammation but without tubercle bacilli. It contains specially a large number of mononuclear cells.

The Meaning of Positive and Negative Reactions.—A positive reaction means that the organism contains antibodies against tuberculosis. As these antibodies are only acquired by an infection of the individual, it means consequently that the organism has had to struggle against the infection with tuberculosis. The reaction itself does not say at all what the result of that struggle was. It may be that the infection led to a very large focus formation of the microorganism, or it may be that only some glands became tuberculous. That every positive reaction means infection with tuberculosis, has been proved by a great number of postmortem examinations. In autopsies of 164 children who had given a positive reaction, in 161 a tuberculous focus was found, and only in three cases the pathologic investigation was negative. It is very probable that even in these cases some small focus escaped detection. The cutaneous reaction is practically the same as Koch's fever reaction; and we know, that in cattle, with every distinct positive reaction we find some tuberculous lesion also, the size of which may be very variable. An intense positive reaction means that a tuberculous infection has occurred recently, or that in an old tuberculosis some progress or some reinfection has taken place. As to the extent and the localization of the focus, we can say nothing from the size of the reaction, but we must use all methods of physical examination to determine where the lesion is.

(2) A negative reaction means in general that the patient has no tuberculous affection. One cannot absolutely depend on a single negative issue, and it is safer to repeat the reaction after a week. In case it is then negative again, we can say almost with certainty that the patient does not contain a tuberculous focus. This certainty, however, is never an absolute one, because there are several reasons why a patient in spite of his tuberculous focus may contain few or no antibodies. In this way the following reasons for a negative issue have to be noted. (a) Last stage of lung tuberculosis or emaciation from tuberculosis of other organs. In very progressive tuberculosis the reaction often fails, so that it was even found that one could use a negative reaction in a certain tuberculosis as a sign of an unfavorable prognosis. Stress should not be laid on the issue of the cutaneous reaction in progressive tuberculosis. (b) In acute miliary tuberculosis and in tuberculous meningitis the reaction generally fails one or two weeks before death, but here also this is not invariable, as we see cases in early childhood retaining a positive reaction up to the last day of life. (c) During tuberculin treatment: If a patient is treated regularly with an ascending amount of tuberculin injections, he loses his cutaneous reactivity after a certain point of immunization is reached. (d) During measles with the onset of the exanthem, the positive reaction of tuberculous patients disappears and reappears only about a week afterward. This point up till now has found no exception, so that one is able to make the diagnosis of measles if a tuberculous child loses its reactivity during an exanthem of a doubtful character. (e) Besides these examples there are some cases with little or no reactivity in spite of a tuberculosis, in which we cannot yet indicate the reason why the antibodies are lacking. As a rule, cases with a very slight reactivity, that is with a small papule or a late or secondary papule formation, denote some slight and inactive tuberculous lesions, but one cannot depend on this rule in every case.

As to the practical application, adults and children must be considered separately. In adults slight affections of tuberculosis are so common that the presence of a positive reaction alone does not tell us very much. There are only two things in adults which can be used: (1) A very intense reaction after the first trial, which indicates a fresh infection or reinfection; (2) a repeated negative issue of the trial, by which one is able to exclude tuberculosis. In children the infection with tuberculosis is not so common as in adults, and the younger the children are, the more dangerous is the infection. Thus, in an apparently healthy child of 10 years, showing no organic lesion, a positive reaction will not disturb us, whereas in a child of one year every positive reaction means a serious danger. In children, furthermore, the positive reaction gives a great aid to the diagnosis of some disease in question, as at this age infections with several kinds of bacteria are not so common as in adults, and therefore one can be almost certain that some symptom in question, say a bronchitis, if the tuberculin reaction is positive, is due to the same microorganism.

The cutaneous tuberculin reaction should be used in private practice only if some symptom leads to the suspicion of tuberculosis; for instance, if children are pale or without appetite, or have a bronchitis, some skin affection, etc. In hospitals, however, the test has been recommended as a routine examination of every child accepted, in the same way as we examine the urine in every case. Finally in orphan asylums which treat children up to 5 or 6 years, the cutaneous test should be used as a prophylactic means to segregate the tuberculous children from those who are free from tuberculosis. See VACCINE THERAPY. ☚

Moro's Inunction Test.—An ointment of 50 percent tuberculin in lanolin is rubbed into the skin of the chest or abdomen which is left exposed for 15 minutes. In a few hours to three days, papules and probably erythema will appear if the individual is affected. And see VACCINE THERAPY.

The methods of von Pirquet and Moro are entirely innocuous.

TUBERCULOSIS.—An infectious disease due to the introduction into the system of the bacillus tuberculosis, discovered by Koch in 1882. It has a very wide-spread, almost a universal, distribution, and it is estimated that fully one-seventh of all mankind die of it.

Etiology.—The bacillus, the essential etiologic factor, gains entrance into the body with the inspired air, with the food, and by direct inoculation. The commonest mode of introduction is by inhalation; in consequence, the respiratory tract is the most frequent seat of tuberculosis. The bacilli become disseminated in the air chiefly through the agency of the sputum of persons afflicted with pulmonary tuberculosis. The sputum of such individuals contains countless bacilli, which are held in it as long as it is moist, but are scattered through the air when the sputum becomes dry and pulverulent. When tuberculosis is acquired through the food—an occurrence not rare in childhood— it localizes itself primarily in the intestinal tract. The food that most often conveys the disease is milk from tuberculous animals, more rarely tuberculous meat. Direct inoculation does not play an important rôle in the causation of the disease.

The status of **heredity** as a factor in the propagation of tuberculosis is not yet fully settled. Isolated instances of apparently hereditary transmission, both in man and in animals, are recorded and demonstrate that the disease *may be* inherited; but in the majority of cases the acquisition of tuberculosis is postnatal. There is, however, a manifest tendency of the disease to attack the offspring of tuberculous parents, which, as it is not the result of hereditary transmission, must indicate the existence of a predisposition or susceptibility, which is transmitted from parent to child.

The bacillus of tuberculosis is a short, rod-shaped, nonmotile bacterium, 3 to 4 micromillimeters in length, and from 1/6 to 1/8 as broad as it is long, often slightly curved, and when properly stained with anilin dyes, occasionally has a beaded appearance. Its characteristic staining property is due to the fact that after being stained with carbolfuchsin it is not subsequently decolorized by immersion in a strong solution of nitric acid.

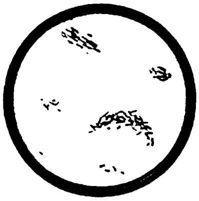
Bacillus Tuberculosis, from a pure Culture. (×1000).—(*Williams.*)

Methods of Staining. *Ziehl-Neelsen Method.*—Float the cover-glass preparation upon Ziehl's carbolfuchsin—saturated alcoholic solution of fuchsin, 10 c.c.; 5 percent phenol water, 90 c.c. Heat until vapor arises (about 3 to 5 minutes), wash in water, and decolorize in 15 percent nitric, or 5 percent sulpuric, acid, then in 60 to 80 percent alcohol to remove the remnant of color. Wash well, dry, and mount in balsam. In the case of tissue-sections stain cold for 15 minutes, and decolorize as detailed; upon removal from the alcohol, counterstain with methylene-blue, wash, dehydrate, clear, and mount.

Gabbett's Modification of Fränkel's Method.—Stain in Ziehl's carbolfuchsin for about 2 minutes without heating, wash in water, stain in 25 percent sulphuric acid (100 c.c.) and methylene-blue (2 c.c.) for 1 or 2 minutes, wash in water, dry, and mount. In the case of sections dehydrate with alcohol, clear, and mount. A good and quick method but not so reliable as the preceding.

Koch-Ehrlich Method.—Stain the cover-glass preparation for 24 hours at the temperature of the room, or for 15 minutes with heat in anilin water, alcoholic solution of fuchsin, gentian-violet, or methyl-violet (prepared by adding to anilin water enough of a concentrated alcoholic solution of the dye to produce opalescence). Then immerse the preparation in 33 percent nitric acid, and when it assumes a yellow-green tint, transfer to 70 percent alcohol. Counterstain 1 to 5 minutes in methylene-blue, malachite green, or picric acid for fuchsin; in Bismarck brown for gentian-violet or methyl-violet. Wash in water, dry, and mount in balsam. Prolonged action of the nitric acid will decolorize the bacilli.

Tubercle Bacilli in Sputum.—(*Greene.*)



Tubercle Bacilli in Urine.—(*Greene.*) Observe tendency to form groups.

Unna's Method.—Stain for from 10 minutes to several hours in polychromic methylene-blue (Grübler's) wash in water, and treat with a 33 percent aqueous solution of tannic acid for from 2 to 5 minutes. Wash thoroughly, and transfer to absolute alcohol, gold-orange alcohol, or to 25 percent nitric acid; follow with dilute alcohol, water, and absolute alcohol. Clear in bergamot oil. This process double stains tubercle bacilli and leprosy bacilli.

And see Urine Examination.

The lesion produced by the growth of the bacillus of tuberculosis is known as the **tubercle** (miliary or gray tubercle or nodule). This is a small, grayish, translucent nodule, from 1/10 to 2 mm. in diameter, firmly embedded in the surrounding tissues. By the coalescence of neighboring

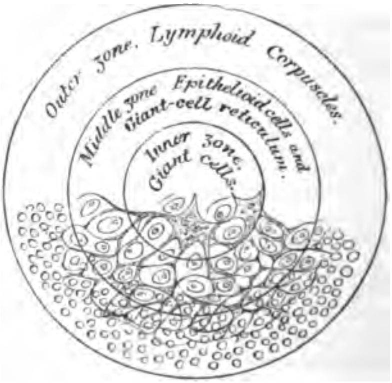

Outer zone, Lymphoid Corpuscles.
Middle zone Epithelioid cells and Giant-cell reticulum.
Inner zone, Giant cells.

Diagram of the Minute Structure of Tubercle. (*Walsham.*)

tubercles large masses, the so-called **tubercular infiltrations,** are produced. Histologically, a typical tubercle consists of 3 groups of cells—the epithelioid, the giant cells, and the round or lymphoid cells. The first are oval in shape, have a vesicular nucleus, and are the result of the proliferation of the fixed connective tissue and endothelial cells; perhaps, also, of epithelial cells. The formation of the oval cells is the first effect produced by the tubercle bacillus. The giant cell is a large, multinuclear mass, usually situated in the center of the tubercle. It may be the product of repeated nuclear multiplication in a single cell, without division of the cell protoplasm, or the result of the coalescence of several adjacent cells. The round cells are leukocytes that have emigrated from the blood-vessels, and they may be so numerous as to conceal the other cells (**lymphoid tubercle**). The bacilli are found in the giant cells, between and in the epithelioid cells, and, in later stages, in the round cells. New blood-vessels are not formed in the tubercle.

The tendency of the tuberculous formation is to undergo a peculiar form of coagulation, known as **cheesy necrosis.** This gives rise to a structureless, yellowish-white mass, which microscopically shows an almost total absence of nuclei in the central area, while at the periphery, nuclei, both normal and in various stages of degeneration, are found. The necrotic tissue does not, as a rule, take any stain. For this degeneration two factors are responsible—the absence of blood-vessels and the action of peculiar poisons elaborated by the bacillus. The breaking down of tuberculous areas in the interior of organs gives rise to *cavities,* which may be seen in muscles, bones, brain, lymphatic glands, and elsewhere, but are most pronounced in the lungs, where they may attain a very large size. On surfaces—skin and mucous membranes—tuberculosis often leads to the formation of *ulcers,* which are characterized by an irregular, eroded appearance, and by the presence of tubercles. Tuberculous areas occasionally become secondarily infected with pyogenic or saprophytic organisms. The tubercle bacillus itself is capable of producing pus, but the majority of the so-called tuberculous cold abscesses are merely collections of fatty and disintegrated cells and tissue detritus.

Tuberculosis is primarily a local disease—extension takes place by continuity and contiguity along the lymph channels, along the respiratory and intestinal tracts, and through the blood. It is usually possible in secondary tuberculosis to demonstrate the original focus, but in the case of tuberculous lymphatic glands the source of infection is not always discoverable. This has been explained by assuming that infection may take place *in utero,* and the bacilli lie dormant in the lymphatic glands for varying periods after birth (**latent tuberculosis**). The possibility has also been suggested that the bacilli may penetrate a mucous membrane, be carried to the nearest lympathic gland, and unfold their activity there.

In the human subject tuberculosis appears under various forms, presenting clinical differences, but identical from the pathologic standpoint. Since the discovery of the tubercle bacillus such diseases as scrofula, lupus vulgaris, Pott's disease, many forms of chronic joint-disease, and the anatomic tubercle have been proved to be tuberculous in nature. The most frequent seats of tuberculosis are the lung, the intestinal tract, the lymphatic glands, the serous membranes, the bones, the skin, the testicle, the epididymis, the brain, the fallopian tubes, the uterus, and the spleen. Tuberculosis is very frequent in the lower animals, attacking especially the domestic herbivora and fowls and wild animals kept in captivity. In cattle the lesions take the form of nodes and conglomerates, which, on serous membranes, may be pedunculated (**pearl disease**). Histologically, there is in bovine tuberculosis a greater tendency to the formation of fibrous tissue than in the human form. The symptoms of tuberculosis vary with the localization of the disease.

A few **general phenomena** are common to nearly all forms—viz., emaciation, loss of strength, anemia, fever, and sweats. Amyloid degeneration may occur in various organs when the disease is associated with prolonged suppuration. In the diagnosis of tuberculosis the demonstration of the presence of the bacillus is of the highest importance.

TUBERCULOSIS, ACUTE MILIARY (**Diffuse General Tuberculosis**).—An acute and rapid form of tuberculosis in which the tubercle bacilli are distributed throughout the entire system without seeming predilection for any special organ.

It generally occurs in persons between 12 and 20 years of age.

Three varieties are observed (1) general infection; (2) general infection with pulmonary symptoms; (3) general infection with cerebral and spinal symptoms.

Etiology.—It arises most commonly from a caseating focus in some portion of the body—especially in a lung or a lymphatic gland—which breaks down, distributing the bacilli to other parts of the system by the blood current. The natural defenders of the body—the leukocytes, serum, and internal secretions—are thus overpowered before a reactionary force sets in. Typhoid fever, la grippe, or any disease that lowers the vitality may aid in causing the onset.

Pathology.—All the organs are involved, and contain small, miliary, discrete tubercles resembling mustard seed. They are very abundant in the lungs, brain, and may be detected on the choroid or retina by means of an ophthalmoscope.

Symptoms.—The general or typhoid form of acute tuberculosis is very often mistaken for typhoid fever. The onset usually lasts a few days or weeks, with loss of flesh and strength, night-sweats, slight fever, especially in afternoon, cough, rapid respiration, feeble pulse, flushed cheeks, and, later, delirium and stupor.

Instead of the regular diurnal variation of temperature it may be very irregular, jumping suddenly from 99° to 104° F., marked by rapid delirium, and possibly convulsions. The general symptoms depend upon the organs mainly involved.

Focus of Disease in the Lungs. Phthisis Florida, Galloping Consumption.—There are two forms: (1) the lobar form of miliary tuberculosis following chronic bronchitis, chronic pulmonary tuberculosis, whooping cough, measles, etc.; (2) pneumonic or bronchopneumonic phthisis. There are a severe cough with an acute pain in the side, accompanied by a purulent expectoration, often tinged with blood; intense dyspnea; cyanosis; subcrepitant râles over the bases of the lungs; the lungs may give a normal note on percussion except over the seat of focus, which is seldom found. Tubercles may be found in the choroid.

Focus of Disease in the Meninges. Tuberculous, Meningitis.—There are intense headache, high fever, delirium, convulsions, stupor, coma, irregular pupils, local paralysis, irregular, slow pulse, and other symptoms of inflammation of this tissue. See MENINGITIS, (Tuberculous).

Focus of Disease in the Intestines or Peritoneum.—There are intense pain over the affected area, tympanites, sudamina, harsh, dry skin, diarrhea, disturbed digestion, and dilated pupils.

Diagnosis.—Tubercle bacilli are often found in the blood therefore it should be examined in doubtful cases.

ACUTE GENERAL TUBERCULOSIS.	TYPHOID FEVER.
1. Epistaxis not common.	1. Epistaxis and diarrhea.
2. Irregular temperature with rapid exacerbations.	2. Temperature shows a regular diurnal variation.
3. Rash infrequent.	3. Rose-red spots on abdomen.
4. Hurried respiration, cyanosis, dyspnea.	4. Respiratory rhythm regular.
5. Moist subcrepitant râles.	5. Dry râles, sonorous and sibilant.
6. Intestinal hemorrhage rare.	6. Intestinal hemorrhage common.
7. Tubercles often present in meningeal variety.	7. No tubercles on retina or choroid.
8. No Widal reaction.	8. Widal reaction.

Typhoid fever is generally more protracted in duration and there is a leukopenia, while in acute tuberculosis upon the incidence of mixed infection there is a leukocytosis. It is differentiated from intermittent fever by the temperature, absence of hematozoon of malaria, and negative therapeutic test.

Prognosis.—The disease always terminates fatally.

Treatment is purely symptomatic. If the meninges are involved, excruciating pain must be combated by hypodermics of morphin, 1/4 grain every 3 or 4 hours. A combination of bromid of potassium (30 grains) and morphin (1/4 grain) may be given to produce sleep. In all varieties a light, nutritious diet should be given.

TUBERCULOSIS, OCULAR.—Since the employment of the tuberculin tests, ocular tuberculosis has been found to be much more common than was formerly supposed. The consensus of opinion to-day seems to be that tuberculin (*q. v.*) is of decided value not only in the diagnosis but also in the treatment of tuberculosis of the eye. For a positive diagnosis a local reaction must be obtained with the tuberculin test. If two tests are negative, tuberculosis can be excluded with reasonable probability. According to Darier, a violent local reaction in the eye may be controlled by guaiacol injections (1 to 2 percent) subconjunctivally. If the reaction is positive tuberculin injections, forced feeding, rest, fresh air, etc., should be instituted at once. If in 2 to 3 months, no decided improvement is noticed, the human tuberculin should be supplanted by the bovine strain as a mixture of the two should be substituted, for the bovine strain may be the agent of infection. If the eye disease is secondary to glandular infection the bovine strain should be used; if secondary to pulmonary infection, the human is generally indicated.

As adjuvant to the tuberculin injections, Darier advocates the use of guaiacol in inunctions or subconjunctival injections, the guaiacol being preferable in the form of the cacodylate. See special headings: CONJUNCTIVITIS, CORNEA, IRITIS, etc.

TUBERCULOSIS, PULMONARY (Phthisis).—A specific infectious disease, due to the tubercle bacillus; characterized by the formation of tubercles in the lungs, which have a tendency to undergo necrosis; and manifested clinically by dyspnea, progressive loss of flesh and strength, night-sweats, hemoptysis, evening rise of temperature, and the expectoration of sputum containing tubercle bacilli.

Chronic Ulcerative Phthisis. Symptoms and Signs of the Early Stage. Subjective Symptoms.—(1) Progressive weakness and emaciation without apparent cause; (2) nocturnal sweats; (3) cough, especially in the morning, with expectoration of a whitish or yellowish mucus often tinged with blood (hemoptysis); (4) morning nausea; (5) local chest pains or tightness across affected area; (6) dyspnea; and (7) laryngitis.

Objective Symptoms.—(1) Diminished expansion over the affected area; (2) slightly increased tactile fremitus; (3) impaired resonance on percussion; (4) inspiration harsh and high pitched, and expiration prolonged; frequently "cogged-wheel" respiration; (5) exaggerated vocal resonance; (6) presence of mucous râles (often subcrepitant) at the apices of the lungs, sometimes posteriorly over base of lungs, and best heard when the patient coughs; (7) afternoon rise of temperature, with flushed face, usually after 4 o'clock; (8) a rather rapid and feeble pulse; and (9) generally the appearance of tubercle bacilli in the sputum.

Symptoms of the Late Stage.—The symptoms of the early stage exaggerated: Bacilli more abundant, the weakness and emaciation become more profound, night-sweats excessive, higher temperature and hectic symptoms, diarrhea, mucus often greenish, containing small, nummular lumps, cheesy in character, and containing many bacilli.

Predisposing Causes.—

1. **Hereditary tendency** is probably the most potent etiologic factor in the determination of tuberculosis. A phthisical chest may be thus inherited.

2. **Sequel of certain diseases** is the next most common cause. Of predisposing diseases may be mentioned pnuemonia, typhoid fever, influenza, bronchitis, asthma, pleurisy, diabetes, and cirrhosis of the liver.

3. **Occupations,** such as coal-mining, glass-workers, mattress-makers, stone-cutters, street-sweepers, and close confinement in shops.

4. **Improper habits,** such as from alcohol, neglect of proper amount of food and sleep, exposure, overstudy, and sedentary habits.

5. **Residence** in a low, damp, ill-ventilated, imperfectly drained, dusty locality; sleeping with a person suffering from tuberculosis.

6. **Age.**—From 20 to 35 is the period of life at which the disease is most often manifested.

7. **Cold climate** is a predisposing factor.

Method of Entrance of Tubercle Bacillus into the System.—(1) **Respiratory tract,** as from inhalation of dust which carries the bacilli; (2) **Gastrointestinal tract,** as from infected milk (common in children); (3) **Inoculation;** (4) **Direct parental transmission** through the placenta (very rare).

Pathology.—There is no doubt some underlying condition of the system that the eye has not been able to perceive, or some chemic change produced in the fluids and tissues of the body that causes certain *foci of least resistance,* and renders the affected parts vulnerable to the attack by the tubercle bacillus. When the bacilli come in contact with such tissue, they are distributed throughout these foci by the lymph, blood, wandering connective-tissue cells, and leukocytes. The characteristic inflammatory process is usually a slow one, and the dominant action tends toward degeneration, with but a slight apparent attempt to form new tissue from the newly formed granulation cells.

The characteristic lesion produced by the bacillus of tuberculosis is a **tubercle,** which is a minute nodule, often the size of a millet seed, grayish or whitish in color, and quite translucent. If a section is made of a tubercle, it will be seen to have a certain arrangement: in the center of the nodule are a few large cells, with many nuclei (20 to 30), and two or three times the size of the surrounding granulation cells, called "giant cells," in which are lodged tubercle bacilli. The central portion of a tubercle has very few cells. Immediately surrounding the central portion of the tubercle are arranged a considerable number of epithelioid cells (wandering connective-tissue cells), and beyond them concentrically are found an abundance of small, round, granulation cells, between which are densely packed myriads of bacilli and many leukocytes. A few giant cells may be seen scattered throughout this area.

Guiteras compares the arrangement of cells from within outward to a "raked field." Cheesy necrosis, with subsequent liquefaction, begins in the center of the tubercle, usually in the giant cells and spreads peripherally. If calcification sets up in the area of granulation cells, there will be spontaneous recovery. Usually septic organisms gain entrance into the tubercle, causing rapid fatty degeneration and excessive ulceration of the surrounding tissues, with the development of cavities. The blood changes show a moderate degree of anemia.

Diagnosis rests upon the physical signs and the presence of tubercle bacilli in the sputum.

Inspection.—The chest is long and flat, the subclavicular region depressed, and the clavicles are very prominent. The angles of the scapulæ bulge, and the ribs are at an oblique direction downward from the sternum. There is diminished expansion over the affected area.

Palpation shows increased vocal fremitus.

Percussion shows impaired resonance or dulness below the clavicle and between the lower border of the scapulæ. If a cavity is present, a tympanitic note will be obtained.

Auscultation.—The inspiration is harsh, high pitched; the expiration prolonged and harsh; cogged-wheel respiration. There is increased vocal resonance. There are mucous râles over the apices of the lungs anteriorly, and over the base of the lungs posteriorly. Pectoriloquy with large râles and amphoric breathing may be detected if there is a cavity.

In doubtful cases the tuberculin test may be resorted to.

Krause claims to be able to make a diagnosis of early tuberculosis especially in children by means of the fluoroscope or radiography before it can be made by any other method.

Acute Phthisis.—A form of phthisis clinically resembling pneumonia in its early stages, usually terminating in death within a few weeks.

Fibroid Phthisis.—A slow form of phthisis in which the physical signs and symptoms gradually develop.

Complications of All Forms of Phthisis.—Pulmonary hemorrhage, pneumonia, pleurisy, diarrhea, extension to other organs, as the larynx, brain, kidneys, liver, peritoneum.

Distribution of Tubercles in the Body.—(1) Lungs (adult); (2) Lymph-glands, bones, and joints (in children); (3) intestines; (4) peritoneum; (5) kidneys; (6) brain; (7) spleen; (8) liver; (9) generative organs; (10) pericardium; (11) heart.

Prognosis is in the main unfavorable, although under proper treatment, change of climate, and other favorable conditions life may be prolonged for years.

Treatment.—In the treatment of pulmonary tuberculosis the first and most essential element is confidence on the part of the physician in the resources of his art. The prognosis is yearly becoming more favorable as the probability of recovery under good management is better realized, and the principles of treatment become better understood. It is, moreover, necessary for the attendant to be assiduous and minute in his care of the details of treatment, for upon these depends success or failure. Each patient must be an individual study, and the general plan should be modified in accordance with his reaction to remedies, and with the progress of the case. It is necessary to dwell upon these points, for they are often neglected.

Of the remedies useful in the management of pulmonary tuberculosis drugs occupy a distinctly secondary position. The chief reliance is to be placed upon hygienic measures—the scientific use of air, sunlight, water, food, rest, exercise, etc.—that will improve nutrition and increase vital resistance. Especially does this apply to the preventive regime that should be instituted from birth, if possible, in the case of those specially liable to the disease by heredity, whether the ancestral taint be tuberculosis itself or some other condition—for example, syphilis or carcinoma—likely to produce hypotrophy in the offspring. The patient's daily life must, therefore, be controlled as far as circumstances will permit. The treatment of tuberculosis among the well-to-do is thus both easier and more successful than among the poor. For both classes sanatoriums are often to be preferred; but the personal, mental, and moral equation must be considered in deciding this.

The principal subjects of care are:

1. Place of residence, including both climate and dwelling-house.
2. Clothing.
3. Rest and exercise in general; including exposure to light and air, occupations and amusements.
4. Food.
5. The use of water, internally and externally.
6. Special pulmonary exercise, including the use of air at modified pressure.
7. The regulation of secretions and excretions.
8. The use of drugs (1) to improve general nutrition, (2) to improve special functions, (3) to antagonize the tuberculous processes, (4) to meet special indications.

These may first be considered in a general way, and later the modifications for special cases and stages of the disease may be indicated.

Place of Residence.—The subject of climate is more fully considered under CLIMATOLOGY (*q. v.*). Climatic treatment is desirable whenever possible. In many cases it is best to find a place where the patient can spend his life, and follow his vocation. Whether for this, or for temporary sojourn until health is regained, the place should be one where the patient can be out-of-doors most of the time and at all seasons of the year; though moderate change of location with seasons is sometimes beneficial for the sake of physical and mental variety. In many cases, especially in early tuberculosis, and in cases characterized by persistent high temperature, an ocean voyage, preferably of not less than a month's duration is the best therapeutic measure available.

With reference to climate the majority of patients fall into one of two principal classes—the robust and those needing protection. This may depend upon original constitution or upon the type and stage of the disease.

As a rule, the robust are benefited by cold and altitude, and some, in addition, by a certain degree of hardship—roughing it, as in lumbermen's camps and upon cattle-ranches. Good judgment is needed in the gradual increase of hardship, as sudden change from coddling to the opposite extreme would be likely to prove fatal. Among counterindications to altitude that need to be insisted on are (1) readiness of disturbance of cardiovascular balance, (2) cardiac weakness, (3) small size of heart, (4) neurotic or erethistic temperament, (5) persistent high temperature.

Those that need protection do better, as a rule, in warm or equable and comparatively dry places at the sea-level or but little elevated. Between these classes is a third to whom cold and moderate elevation, say not over 2000 feet, proves stimulating and restorative. In all cases purity and reasonable dryness of the atmosphere is a desideratum. The best of judgment is necessary in the choice of climate, and routine direction of every patient to one place or one class of places is productive of much harm. When patients cannot go far from home, something may still be done to improve their surroundings. Thus, both for air and light, the country is preferable to the city, a wide street to a narrow one, a detached house to one shut in on both sides. A hillside is better than a valley, a dry, sandy soil than moist clay. When the subsoil water approaches within 6 feet of the floor of the cellar, the first floor of the house should be sufficiently elevated; a cemented cellar is desirable. The air of the house should not be too dry, as air devoid of moisture provokes cough, and may induce hemorrhage. It should be constantly renewed, preferably through open windows. Other means of ventilation should be provided for bad weather. The temperature should be equable and not too warm. Except when special indications require it otherwise, 65° F. is a desirable standard. The temperature of the bedroom, which should be occupied only at night, and by no other person, should rarely exceed 60° F. The bedroom should have a high ceiling, and be as large and as sunny as possible, 1500 cubic feet of air-space being the minimum. There should be several windows for constant ventilation during the day. If there is a fire in the room, it should be in an open grate. The furniture should be as simple as possible. Electric light is preferable to any other, and lamp or candle to coal-gas.

When there is no counterindication, at least one window should be open at night, the patient being protected from draft.

The clothing should be warm, but light, loose, and not oppressive. As far as possible it should be of open texture, and should be changed with climate, seasons, and weather. Woolen or silk underwear, or a mixture of wool and cotton so arranged as to absorb the perspiration quickly and as quickly yield it to the outer air, should be worn both winter and summer. Protection is needed for the entire body, including the extremities; and the stockings are as important as the undershirt. Corsets, close-fitting waists, low-bosomed gowns, and tight belts are to be forbidden. Close-fitting scarfs, fur boas, and the like, around the neck are harmful, as are wadded flannel and buckskin "chest protectors," plasters, and similar abominations so often discovered upon stripping the patient for examination. In our northern climates extra wadding in and between the shoulders of the coat worn in the late fall and early spring, and a cape to the winter overcoat are often desirable. Sealskin and other heavy wraps are to be avoided. Patients with weak circulation should be well wrapped when driving, and when necessary, should use muffs and foot-warmers. Waterproof outer garments are in some cases a less evil than a wetting; they should be removed immediately on going indoors. As little clothing as possible should be worn in bed, the bed-covers being varied as necessary. A long woolen night-gown of light weight, or a "union" suit of the same material, is the best in most cases. Hair mattresses with spring supports are best. Metal is better than wood for the bedstead, being more easily cleansed. Night-dress, underwear, and bed-covers must be changed even more frequently than ordinary cleanliness requires.

Rest and exercise must be considered together, the usual fault of physicians and patients alike being to insist too much upon one or the other. Individualization, the key to successful treatment generally, is in this matter specially necessary. When there is as yet no demonstrable lesion, and one merely suspects tuberculosis, a weak patient—especially a young, anemic girl—should be put to bed, if possible, and the Weir Mitchell "rest cure," or some modification—with massage and electric applications, and perhaps a daily drive or other nonfatiguing outing—be instituted. Later, and, on the other hand, from the beginning in a fairly robust person, active physical exercise should be gradually begun and increased, and preferably such as will keep the patient out-of-doors. Sports of various kinds, especially those which gently exercise the chest muscles, and afford pleasant diversion to the mind; systematic gymnastics, especially of the respiratory muscles; walking, bicycling, horseback riding, and even driving in an open carriage, are to be recommended; always in moderation, and according to the patient's condition. When there are extensive lesions, especially if there is constant and decided elevation of temperature, rest is absolutely necessary; and exercise should be the least and gentlest. It is not always necessary to rest indoors; a hammock swung in sun or shade, according to season and climate, a steamer-chair on porch or deck, are frequently preferable to couch and bedroom or cabin. As the patient improves, the period of rest is to be diminished, and exercise is to be quantitatively and qualitatively increased. Besides these illustrative extremes (and, indeed, in every case, as it passes through its stages of betterment or deterioration), there are many varieties of physical and mental conditions to which the physician's advice as to judicious alternation of rest and exercise must be adapted. Thus, when a patient with moderate lesions and no fever is unable to leave the city, a good plan of outdoor exercise is to have him walk slowly along the street in the opposite direction to the car-track, so that before fatigue occurs he may ride home. Or he may ride to a park (such as Fairmount in Philadelphia), and there walk and sit, again walk and sit, and, finally, after an hour or so, ride home. In many cases where the character of the country permits, ascents proportionate to the age and strength of the patient may be prescribed. They should be made with slow and measured steps and rests by the way. To expand the lungs while climbing, the elbows may be approximated behind the back, and a walking-stick may be supported between them. Whether walking on a level or climbing, the patient should be instructed to breathe deeply and slowly. Whether with the weak or the comparatively strong, fatigue is always to be avoided; exercise, therefore, should be instituted in a mild form and gradually increased.

Open-air treatment is of decided value. Exposure to **open air** and to **sunlight** should be as frequent, as long, and as thorough as the climate, season, weather, and patient's condition and endurance permit. The roof or back yard may be used on pleasant days. Even if circumstances compel housing, the endeavor should be made to get the sun and fresh air into the room where the patient sits or reclines. He should rest, warmly wrapped, before the open window. At night the windows should be kept open. The importance of this treatment cannot be too often reiterated.

In choosing an **occupation** for one thought to be liable to tuberculosis, or in the management of a patient already showing symptoms of the disease, the desirability of open-air life must be borne in mind. Many persons recover through change of business. Quite in point is Benjamin Franklin's celebrated instance of the man who contracted consumption while a shoemaker, and recovered while riding as post-boy between New York and the Connecticut River (about 140 miles) in all seasons and weathers. Most patients are kept indoors too much on account of weather. While care is necessary, it is best to be out whenever possible.

Amusement is quite as important as occupation, and requires equally good judgment. When the patient has tastes and means for a pleasant avocation, his desire should be gratified. In any case the endeavor should be made to divert the mind from self by reading, music, games, theater, concert, and lecture (when this does not involve too long a stay in an overcrowded hall), or whatever means are available. Undue excitement, however, is to be avoided.

Food is to be carefully chosen with due consideration of the habits and digestive capacity of the patient. Nutrition, nutrition, nutrition, is the essential of treatment; and food the essential of nutrition. Two mistakes are to be avoided—overfeeding and underfeeding. Often the patient lacks appetite, but is able to digest and assimilate much more food than is required in health. In such cases it is wise to feed up to the limit of digestive capacity, and for this purpose twice daily, after a preliminary lavage with a warm solution of sodium bicarbonate (1 dram to 1 pint), about a quart of fully peptonized milk, with one or two eggs, an ounce of beef-powder, 30 drops of dilute hydrochloric acid, and 5 or 10 grains of pepsin may be introduced through the stomach-tube. The ingredients are to be thoroughly mixed, and the temperature of the mixture should be about 100° F. In addition to the gavage, the patient may be allowed to eat a midday meal of such permissible food as pleases his palate. Other patients will need only to be encouraged to eat sufficient food, and gavage will be unnecessary. In other cases the digestive capacity and the exercise taken become important factors in permitting the amount of food given to be increased. The assimilative power is impaired, and until, by proper management, this has been restored, it will be necessary to restrict the quantity and kinds of food. As a general rule, subject to modification in individual cases, patients having good prospects of recovery or partial recovery should be fed as bountifully as possible; while those in the later stages, with the end nearing, especially when active exercise has been interdicted, should not be given large quantities of food. In the average case the meal, should be comparatively frequent—say 6 *per diems* at intervals of about 3 hours. At three of these meals there should be taken as much as one in good health ordinarily eats. The others may consist of a plate of soup or a glass of milk or of cream or a half-dozen oysters or a sweetbread or a squab or something similar. It is often well to drink a glass of hot milk just before going to bed; and in some cases milk or a liquid preparation of so-called peptones or a glass of a good wine of coca should be at hand to be taken if the patient awakes during the night. A half-hour before meals 1/2 of a pint or a pint of hot water is often of use in preparing the gastric mucous membrane for the reception and disposition of the food. Simplicity in diet is necessary. Nitrogenous and fatty elements should predominate, sugars and starches be reduced to a minimum.

Cod-liver oil, plain, or emulsionized with the aid of pancreatin, is one of the best of fatty foods. It may be given in doses of 1/2 of an ounce or less after meals. In some cases beef or mutton fat, butter, olive oil, and the like, serve equally well, and, being utilized in the ordinary way, seem less like medicine. Milk, preferably hot, is to be taken freely; if possible, a quart and a pint of milk and a pint of cream daily. Koumiss, kefyr, and the like may be substituted for plain milk or alternated with it. Soups, such as bouillon, oyster broth, clam broth, mutton broth, beef broth, turtle soup, barley, rice, bean and pea soups and purées, celery broth made with milk and thickened; are useful. Beef, underdone, roast or broiled; mutton or lamb roast, or broiled chops; sweetbread; brain; poultry, broiled, roast, or stewed; nearly all kinds of game; fresh fish; salt codfish; salt mackerel; eggs, steamed, boiled, poached, beat up with milk, should be the principal articles of diet. Nothing should be fried. The green vegetables—lettuce, spinach, asparagus, watercress, and the like—are of great service; as are, likewise, the legumens—peas, beans, lentils, etc. Fresh fruits of all kinds are to be freely used in the absence of special counterindication. Of starchy foods, rice, well cooked, and occasionally sago, tapioca, etc., are the best. Potatoes, turnips, carrots, beets, and other starchy and sugary roots and tubers are to be avoided altogether or used very sparingly, for occasional variety. The infrequent potato should be "roasted in the jacket" until it becomes ready to fall into powder when opened; or, if necessary, "twice baked." Other desirable vegetables are tomatoes, onions, and celery. Cereals—hominy, oatmeal, cracked wheat and similar preparations—may be used in moderation if well digested. Bread should be reduced to the minimum consistent with comfort—toast, zwieback, and pulled bread being preferable to ordinary bread. Hot bread, cakes, pies, pastry, sweetmeats, made dishes, rich gravies, crabs, lobsters, and, among meats, pork and veal are to be strictly avoided.

The best beverage is water, to be taken freely; the purer the better. Mineral waters offer no special advantage unless needed as laxatives or diuretics. In some cases alcohol is of the highest use, in others useless, and in others harmful. It should not be given as a routine. When given, it should be used in comparatively large quantities —from 4 to 8 ounces of good whisky daily. When the patient is taking sufficient other food, the heart is acting well, and the digestion is good, alcohol is usually unnecessary. When there are fever, impaired appetite, poor digestion, and feeble action of the heart, alcohol usually helps temporarily. While by no means advocating this plan, reference may be made to three cases of remarkable recovery—*i. e.*, restoration to good health of patients with decided pulmonary lesions—upon the old treatment of whisky and cod-liver oil—the quantities ordered having been "as much as you can stand." The period over which the treatment extended in these cases varied from a few months to several years.

Water is to be used freely both internally and externally. Not only the drinking of hot water before meals, but, if necessary, lavage of stomach and intestines with physiologic saline solution or some alkaline detergent solution of about the same specific gravity is to be practised in order to keep the alimentary canal clean, as free as possible of ptomains and other toxins, and the mucous membrane active. In addition pure, cold water, carbonated or still, as may be most palatable, is to be imbibed freely between meals; and may also be taken with meals, in moderate quantity, if preferred. Wine and water (claret or Burgundy) is better than plain water with meals.

Hydrotherapy is of the greatest importance not only as a curative, but also as a prophylactic measure.

Water should also be freely used externally, not merely for cleanliness but as a direct stimulant to the skin and its vessels, and immediately to circulation, respiration, and general nutrition. According to the patient's age, temperament, and strength, the stage of the disease, the condition of the heart and vessels, the individual reaction, the climate, season, and weather, various hydrotherapeutic measures are useful. For details, treatises on hydrotherapy should be consulted. As a prophylactic measure cool or cold sponging on rising in the morning is generally applicable. Those who react well may substitute or add a gentle shower bath or douche—at first for 20 or 30 seconds, later for a minute or more. This is to be followed by forcible, dry friction; and the patient having dressed and having swallowed, not hastily, a glass of hot milk, should take a walk, not long enough to cause fatigue, and then return for breakfast. In unpropitious weather, indoor exercise, gradually increased in activity, may be substituted.

Delicate and sensitive persons not inured to cold bathing must be accustomed to it gradually, tepid water being used at first. In every case the physician should prescribe the temperature of the water and the details and duration of the bath, douche, or other application, with the same care that he gives to the dosage of medicine.

Counterirritation is sometimes useful in the early stages of pulmonary tuberculosis, and especially when there is softening. Cantharidal collodion or a mixture of tincture of iodin, croton oil, ether, and collodion may be employed. The best plan is to irritate successive small portions of the skin over the seat of lesion, allowing one spot to heal before the next application is made.

Pneumotherapy, or the use of air at modified pressures, is among the most important, as it is the most neglected, of our means of defense against pulmonary tuberculosis. The literature of the subject should be carefully studied by every physician. In many cases the use of appropriate apparatus under the physician's direction will obviate the necessity of seeking a change of climate.

There are two forms in which condensed and rarefied air may be utilised. These have been termed the *absolute* and the *differential* methods. The first is carried out by the use of pneumatic chambers modeled after the diving bell, the first of which was constructed for Tabarie in 1838. The patient remains for an hour or more in air gradually raised to a pressure far exceeding the normal (from 1 1/2 to 2 atmospheres), and then gradually lowered. Rarefied atmospheres are theoretically useful, but have not been used in medicine in these chambers. The disadvantage of this method is that its use is limited to certain resorts. The differential method is carried out by apparatus of two different types. In one, the patients remain in the ordinary atmosphere and inhale from or exhale into (or both) cylinders containing condensed or rarefied air. In the other, patients enter an apparatus in which the air about them is condensed or rarefied, while they inhale from and exhale into the ordinary air. The type of instruments of the first class is the gasometer of Waldenburg—the modification of S. Solis-Cohen being the most convenient for use at the patient's home. The type of instruments of the second class is the pneumatic tub of Hauke; the pneumatic cabinet of Williams being the most elaborate.

The physiologic and therapeutic effects of the two types of instruments do not differ; the questions to be considered being merely of expense and mechanic convenience. While the pneumatic cabinet is theoretically capable of the same variation in use as the gasometers, in practice it is impossible to alter its pressure rhythmically with the patient's respiration; hence the air it contains must be either rarefied or condensed during an entire sitting; the patient thus both inhaling from and exhaling into air relatively higher or lower than that surrounding him. The most common use is to rarefy the air of the cabinet, and the patient thus continuously respires relatively condensed air.

In the gasometer instruments any of the following 8 modifications are perfectly practicable:

INHALATION FROM	EXHALATION INTO
1. Condensed air.	Unaltered atmosphere.
2. Condensed air.	Condensed air.
3. Condensed air.	Rarefied air.
4. Rarefied air.	Unaltered atmosphere.
5. Rarefied air.	Condensed air.
6. Rarefied air.	Rarefied air.
7. Unaltered atmosphere.	Rarefied air.
8. Unaltered atmosphere.	Condensed air.

In pulmonary tuberculosis the expedients numbered 1, 2, and 3 are those employed, and chiefly 1 and 3. The most useful is generally 3; which fact alone serves to give this method the preference over the pneumatic cabinet.

If desired, the air inhaled, which is drawn from out-of-doors, and filtered through cotton on its way to the cylinder, may be artificially cooled, warmed, dried, or moistened. The air may be impregnated with the vapor of any medicinal substance, by passing it through a solution in a wash-bottle, by suspending in the condensation cylinder a vial or a sponge containing the drug, or by inserting a sponge or cotton wad, appropriately moistened, in the mouth-piece. The pressures (positive or negative) employed, which are to be gradually increased as the case progresses, range from 1/75 to 1/30 of an atmosphere (1/5 to 1/2 pound to the square inch); and are regulated by weights or counterweights as condensation or rarefaction is desired. The inhalations and exhalations are to be made as slowly and perfectly as possible, the rate of respiration being reduced to 10 or less a minute, if possible; the volume of air inhaled or exhaled being brought up to 200, 250, 300, or even 400, cubic inches as recovery progresses. From 5 to 20 minutes continuous respiration is followed by a rest of the same length, and a repetition of the process. The patient should stand, if able to; the clothing should be loosened, outer garments being removed, and, if necessary, the physician or an attendant should assist respiration by pushing the patient's shoulders back during inspiration, and pressing the arms against the sides of the chest during expiration. The treatment is time consuming and requires intelligent care and supervision; but should not therefore be omitted. When patients can afford to buy or rent an apparatus for use in their own homes, a member of the family or a nurse can readily be instructed in its use. It is worth all the drugs in the Pharmacopeia as a therapeutic measure in pulmonary tuberculosis.

Briefly, inhalation of condensed air produces the following effects: Diminution of muscular effort; increased dilatation of alveoli; increased volume and penetrating power of tidal air; consequent increase of gaseous exchange and volume of expired air; increase of volume of pulmonary circulation; increased absorption of oxygen; increased peripheral circulation; increased metabolism. There result: Diminished frequency of respiration, increased expansion and ventilation, with great increase of vital capacity; diminished frequency, with increased force of heart's action and increased fulness of the pulse.

Exhalation into rarefied air produces the following effects: Contraction of the thorax is facilitated; expiration is made more complete; subsequent inspiration is easier and deeper; pulmonary congestion is diminished; the heart is more thoroughly emptied, and diastole is facilitated. The combination of these procedures is, therefore, an effective means of pulmonary ventilation and of relieving local stases. It acts as a stimulus and a regulation to respiration and circulation, and thus becomes an effective means of restoring both local and general nutrition. The vital capacity of patients is permanently increased, especially by calling into use portions of lung not fully expanded; appetite is improved, and the greater quantities of food consumed are oxidized and utilized. Secretion is stimulated and excretion facilitated. Cough and expectoration are at first increased, from dislodgement of accumulated materials, afterward diminished. Sleep is promoted.

When there is elevation of temperature to 100° F., the method is to be employed only with caution, and not at all if the fever is continuous and marked local changes are in progress. Active softening without fever is also a counterindication. Pneumatic treatment should not be used when there is a large cavity with fluid or semifluid contents; but dry cavities present no objection. If hemorrhage occurs, inhalation should be intermitted, but may be resumed cautiously some time after the bleeding has ceased.

After patients have sufficiently recovered to omit the constant use of the apparatus described, the good effects may be kept up by use of S. S. Cohen's pneumatic resistance valve. By adjusting the springs as shown upon the scale above each valve to one of the figures, 6, 5, 4, 3, there is secured a pressure approximately of 1/60, 1/50, 1/40, or 1/30 of an atmosphere, in resistance to inspiration or expiration or both, as desired; that is, practically, inspiration of rarefied air and expiration into condensed air. The effect is to necessitate greater muscular effort in respiration, and thus to secure regulated pulmonary gymnastics, with stimulation of circulation. It cannot take the place of the other method, but is applicable only with patients able to make the increased exertion; the gasometer being employed when patients need assistance in respiration. It is especially applicable as a prophylactic measure in the young and fairly robust, who need to be given a proper respiratory habit. The inspired air may be medicated by placing a few drops of any suitable volatile drug or mixture (eucalyptol, creosote, chloroform, ethyl iodid, terebene, etc.) on cotton in the receiver.

Sometimes patients may be induced to respire properly through the device of Dr. Ramadge: A tube (a section of ordinary "speaking-tube," with a proper mouth-piece will answer) about 4 feet long, with the far end slightly narrowed, which is to be placed out of the window every morning and noon, while slow, full respiration is practised for from 5 to 30 minutes.

The secretions and excretions are likely to be kept in good order by following the plans detailed as to clothing, outdoor life, food, rest, exercise, and the use of water and of air, but sometimes special treatment or medication is temporarily necessary. These measures do not differ in principle or method from those employed in other affections. Some authors recommend, however, the more or less constant administration of cardiant diuretics, such as spartein sulphate.

Tuberculin Treatment.—After tuberculin was discredited as a remedy, its composition became the subject of research, with the view of obtaining from it a remedial agent free from its toxic constituents. Von Ruck prepared a *purified tuberculin*, also an *aqueous extract* of the bodies of the bacilli; and Koch announced his *tuberculin-r* and the *new tuberculin*, which are emulsions of the pulverized bacilli, the latter being made with water and glycerin as a menstruum. These preparations have been extensively used during the last ten years.

Denys and Trudeau prefer the unheated bouillon filtered free from bacilli. On general principles the filtrates or solutions, such as T. O. (Koch's old tuberculin) and B. T. of Denys, and T. B. K. of Béraneck are safer for the beginner by reason of their greater uniformity of dosage and the generally milder reaction produced than by the emulsions or vaccines T. R. (tuberculin residuum) and B. E. (bacillus emulsion).

Denys and Trudeau recommend 1/10,000 mg. of tuberculin as the initial dose for afebrile cases, increasing by 1/10,000 every third or fourth day until 1/1000 mg. is reached; then increasing by 1/1000 till the dose is 1/100 mg.; then by 1/100, etc.

The entire gradation of solutions necessary would be—*Filtrate*, 1 c.c. of this being the final dose:

Solution in which 1 c.c. = 100 mil.
Solution in which 1 c.c. = 10 mil.
Solution in which 1 c.c. = 1 mil.
Solution in which 1 c.c. = 1/10 mil.
Solution in which 1 c.c. = 1/100 mil.
Solution in which 1 c.c. = 1/1000 mil.
Solution in which 1 c.c. = 1/10,000 mil.

For *febrile patients* begin with sol. 1 c.c. = 1/10,000 mil. (0.1 of this = 1/100,000 mil.).

Begin with .1 and increase .1 every three days.

For *afebrile cases* begin with sol. 1 c.c. = 1/1000 mil. (0.1 of this = 1/10,000 mil.). Begin with .1 of this and increase .1 at each injection three days apart.

When the solution 1 c.c. = 1/10 mil. is reached, it is better to repeat the dose occasionally.

The intervals are extended when the dose becomes 10 mg. or when symptoms of intolerance supervene, such as local reaction, soreness, anorexia, malaise, loss of weight, pains, increased sputum. It is best to allow at least 6 to 10 days between the larger doses, 4 days being allowed as soon as the solution 1 c.c. = 100 mil. is reached. If fever reactions appear, the injections are discontinued till there have been no symptoms of intolerance for at least 2 days; then the doses are decreased (first to 1/2 the previous dose, then increasing at usual intervals) or kept the same until tolerance again exists.

The course of treatment, as outlined by Denys and Trudeau, is 6 to 12 months according to the occurrence or absence of reactions. The aim is to produce tolerance to as large doses of tuberculin as possible by increasing the dose gradually (tuberculin immunization). In most instances a dose of 1 c.c. can be reached. After a lapse of 3 to 6 months a short secondary treatment is advised.

It is advisable to repeat the same dose occasionally especially when the larger doses are reached, the extension of the treatment being advantageous. The dilutions which are made with normal salt solution containing 1/4 of 1 percent carbolic should be made fresh at least every two weeks and should be kept in a cool place.

Injections are best made below the scapula or on the upper aspect of the arm—alternating the side each time.

Tuberculous lesions are due to the bovine bacillus in some cases rather than the human and therefore in these instances the bovine strain produces better results. If no definite improvement obtains after use of the human for three months it is advisable to try the bovine strain or a mixture of the two.

The selection of cases suitable for this treatment requires careful consideration of their history and present condition. The patients must have good nutrition and fairly localized disease without extensive ulceration or complications. The results of the treatment are most encouraging in chronic types of tuberculosis. It is contraindicated in acutely progressing tuberculosis, disseminated, miliary and pneumonic types, those with extensive nephritis, diabetes or cachectic symptoms, and in favorable cases during exacerbations with fever or when complicated with influenza or other acute intercurrent diseases.

In the cases complicated with chronic mixed infections, indication for the treatment can be determined only by careful study of the individual. Tendency to hemoptysis is a contraindication, but bloody sputum due to a mild local reaction is insignificant. Very good results have been obtained in patients whose disease has become arrested by hygienic methods, but who would eventually succumb to chronic phthisis.

Antitubercular Serum Therapy.—No satisfactory results have been attained with antitoxic serums for tuberculosis in any degree comparable to the success with diphtheria antitoxin. It is doubtful whether a true antitoxin in the serum of treated animals exists, although antibodies have been demonstrated. The protracted nature of the disease entailing repeated injections of the sera, unpleasant consequences may arise due to the serum itself. The occasional development of symptoms of "serum disease" (urticaria, joint pains, collapse), militate against the subcutaneous use of serum.

The principal sera recommended at present are those of Maragliano and Marmorek. Of late the latter has found favor in doses of 5 to 20 c.c., per rectum. The dose of Maragliano's serum is from 1 to 5 c.c. subcutaneously; also per os or rectum.

Antistreptococcus serum in mixed infection is of doubtful efficiency, although good results are claimed in some desperate cases. The rectal administration is preferable and safe.

Bacterial Vaccine Therapy.—The inoculation of sterile bacteria prepared according to Wright's methods from cultures obtained from the sputum, a promising method of treatment for chronic mixed infections, is now *sub judice.* See VACCINE THERAPY.

Medication in pulmonary tuberculosis may be directed against some symptom, or may be directed generally to improving nutrition: *i. e.*, vital resistance. Next to cod-liver oil, the most efficient drugs are the creosote group and the iodin group.

The creosote group includes creosote, creosote carbonate, guaiacol, guaiacol carbonate, guaiacol salicylate, guaiacol benzoate, and potassium guaiacol sulphonate (known as thiocol). *The iodin group* includes metallic iodin, Lugol's solution, arsenic iodid, Donovan's solution, diisobutylorthocresoliodid (known as europhen), ethyl iodid, and iodoform.

Of good beechwood creosote large doses may be given by gradual increment without disordering digestion; but many of the commercial preparations contain gross impurities, and are unfit for internal use. Some patients cannot take large doses, or even small doses, of even the best creosote; in which case one of the substitutes mentioned may be used. Creosotecarbonate (creosotal), a syrupy liquid, is even better than creosote and is best given in hot milk, and in doses of from 5 to 60 minims, 3 or 4 times daily. The guaiacol salts are tasteless or nearly tasteless powders, and may be given as such or in capsule, in doses aggregating from 15 to 75 grains daily. Duotal or guaiacol carbonate is sometimes better borne than creosotal. It is given in doses of 3 to 7 1/2 grains three times a day. Beechwood creosote may be given in doses of from 1 to 40 minims 3 or 4 times daily. The average dose is 10 minims. It is best given in milk, about 2 hours after meals. It may be shaken up with a tablespoonful of cod-liver oil, which some patients like, comparing the taste to fat smoked mackerel. Creosote or guaiacol may be given with alcohol, in the form of sherry wine or rum, with or without the addition of gentian or glycerin; or in emulsion with cod-liver oil or olive oil; or in capsule with morrhuol or cod-liver oil. These drugs should not be given in capsule without an oily vehicle. They may be given with milk as a rectal injection or in oily solution of 10 percent or more by intratracheal injection or hypodermically. The dose is generally to be somewhat below the point of tolerance, the urine being carefully watched. Cases of sudden nephritis and other forms of poisoning are on record. Inunctions of guaiacol are valuable, especially in children. Gomenol is said to be a valuable substitute for creosote.

Preparations of the creosote group are most useful in cases in which active inflammatory processes, catarrhal or tuberculous, are in process, and in cases with persistent high temperature, though they may be of service at all stages. Their action has not been satisfactorily explained. They probably have a good local influence during their elimination by the bronchial tract.

Of *the iodin group*, iodoform is the most useful. It is best given in pill (sugar-coated) form. An excellent combination is iodoform and reduced iron, made into pills containing 1 grain of each, the dose being gradually increased to 3 or even 5 pills at a time, after meals, thrice daily. It may sometimes be useful to combine other drugs than iron with the iodoform, in which case gelatin capsules may be used, Peruvian balsam being employed as the vehicle. Iodoform may also be given by inunction, in cod-liver oil or lanolin, as advised by Flick, who employs europhen also in this way. It is most useful in the early stages of the disease or during periods of quiescence in the chronic forms. Creosote and iodoform may be given to the same patient in alternate doses or on alternate days, when the signs in various portions of the lungs so differ as to indicate an advanced or active process here, and a quite recent or sluggish process there.

Cinnamic acid by intravenous injection is highly praised by Landerer, who reports a large proportion of successful cases. The dose is from 1/2 milligram, gradually increased to a maximum of 25 milligrams of *sodium cinnamate*, or cinnamylate dissolved in physiologic salt solution. The injections are repeated about every 48 hours, and continued for several months. The drug acts by increasing leukocytosis. During the past few years good results have seemed to follow the use of a solution of *palladium chlorid* (made with the aid of nitro-hydrochloric acid) of a strength of 15 grains to the ounce, in doses of from 3 to 10 drops thrice daily in water, half an hour before meals. In several cases it seems to have been useful as a substitute for iodoform, rather than for creosote. If given for too long a time, or in too large doses, it causes rapid and irregular cardiac action. Extract of kalagua is the most recent drug that comes well recommended. It is given in doses of from 9 to 20 grains *per diem.*

Mercuric succinimid in intramuscular injections—extolled so highly by Barton Wright and others—has according to recent report proved not only worthless, but injurious.

Of the drugs employed for the *stimulation of general nutrition* strychnin, arsenic (especially in the form of sodium cacodylate), iron, nuclein preparations, and the hypophosphites are the most useful. The best results usually follow from small, long-continued doses and alternation of remedies; though individual cases are benefitted by rapid increase to the point of tolerance.

Digitalis is often useful as an adjunct to the roborant treatment, especially in cases of small heart and feeble circulation. In some instances nitroglycerin may be well combined with it. Digitalis has also special indication during acute processes, as long ago pointed out by Beddoes. In acute phthisis or in febrile exacerbations of chronic phthisis, it should be pushed to the point of tolerance. A good preparation, free from irritating impurities, is necessary. Pepsin preparations given at the same time will help gastric toleration. When the leaves or tincture cannot be used, Merck's German digitalin, as recommended by Beates, may be tried.

Oxygen is useless as a remedy, and may hasten death; but is among the best of palliatives in the latest stages. Combined with nitrous oxid, its inhalation relieves dyspnea and promotes the sense of well being.

Nitrous oxid is among the best palliatives for the relief of cough, of insomnia, and of hectic fever. It is usually best to give it during the forenoon, at two periods separated by about 2 hours. Each inhalation may consist of from 3 to 8 gallons, air being allowed to enter through the nostrils and by the side of the mouth-piece. The patient breathes more freely and more deeply after the inhalation, and cough is quieted, but unconsciousness is not produced.

Certain symptoms require special medication.

Indigestion is to be treated on general principles, but carefully.

Diarrhea is often troublesome, especially toward the end. Diet is to be regulated, milk being excluded, if necessary. Among useful drugs are beta-naphthol, benzonaphthol, beta-naphthol-bismuth, bismuth salicylate, bismuth subnitrate or bismuth carbonate in large doses, bismuth subgallate, hematoxylin, silver nitrate, cupric sulphate, zinc phenolsulphonate, plumbic acetate, and solution of potassium arsenite in small doses. Often morphin or opium is necessary. Before any drug is given the bowel should be thoroughly irrigated with saline solution, and a good cleansing from above with calomel or castor oil and aromatic syrup of rhubarb is often useful.

Vomiting is often the result of cough, especially when there is much effort. In some cases it is nervous, and can be relieved by strychnin given at bedtime. Strontium bromid is among useful gastric sedatives. Otherwise general principles apply.

Night-sweating can usually be checked by atropin in massive or divided doses of from 1/480 to 1/40 grain at bedtime; it should be tried first in small doses, and increased, if necessary. Other useful drugs are picrotoxin, from 1/60 to 1/10 grain hypodermically, if necessary; strychnin sulphate or strychnin nitrate in the same dose; homatropin, of which the dose is said to be from 1/2 grain to 2 grains; agaracin, from 1/8 to 1/2 grain, 2 to 4 times daily; camphoric acid, from 10 to 20 grains in capsule at bedtime; ergot; aromatic sulphuric acid. Dusting with zinc oxid, or sponging with a saturated solution of quinin in alcohol or with a saturated solution of alum in alcohol often helps to control this symptom.

Hemorrhage varies from slight blood-spitting to considerable flow. It may be due to oozing from small vessels, to perforation of a large vessel, or to rupture of an aneurysm within a cavity, and the management varies accordingly. In many cases the bleeding ceases spontaneously, especially if the patient is kept at rest, and doubtless the popularity of many remedies is thus to be explained. If there is more than a mere trace of blood in the sputum the patient should be put to bed and given cracked ice, which is to be allowed to melt slowly in the mouth from time to time. According to the severity of the case, some or all of the following measures are to be adopted:

An ice-bag may be applied to the precordium, and kept on constantly, especially if there is an elevation of temperature. Tincture of aconite may be given in sufficient dosage to quiet the heart and to reduce and keep the pulse-rate to 60 a minute. Crystallized calcium chlorid may be given in solution in doses of 15 grains every second hour, for about 4 days; it is then to be intermitted for 4 days or more, and used again, if need be. In the interval lead acetate, in doses not exceeding 5 grains, thrice daily for 3 days, may be given, to be followed for 2 days by aromatic sulphuric acid in doses of 30 drops, well diluted, thrice daily or oftener. Hydrastinin hydrochlorid in doses of 1/24 to 1/8 grain hourly or less often is sometimes useful. Among drugs to be recommended are also the turpentine group, of which erigeron is among the best. Fluidextract of matico is recommended by Da Costa. Codein may be given by the mouth in doses of from 1/8 to 1/2 grain every second hour or less often; or morphin acetate may be given by the mouth in doses of 1/8 grain every hour or two; or morphin sulphate hypodermically in dose sufficient to prevent coughing absolutely in severe cases.

Atropin sulphate, from 1/200 to 1/60 grain, may be given hypodermically at the beginning of the attack, and will often cut it short.

The patient must be forbidden to speak, except in a labial whisper. Cold liquid food should be given in small quantities at intervals of about 2 hours. The bowels should be moved daily, without straining, by enema, glycerin suppository, or saline purge, as necessary. In desperate cases tannin has been injected into the lung, as also have gelatin solutions.

Fever is best treated by rest (not necessarily indoors) with cold applications, of which the precordial ice-bag is the best. The coal-tar antipyretics may be cautiously used as palliatives, if necessary. Digitalis is often useful. Nitrous oxid is to be tried.

Cough should not be interfered with unnecessarily. It should be sufficient to expel the accumulations of mucopus in the trachea and larger bronchi. The expectorated matters are to be properly received, disinfected, and disposed of (see COUGH). Cough may be checked, when excessive, by opium, hydrocyanic acid, chloroform, or bromids. When unproductive, it needs to be made freer. The ammonium compounds are not often useful. As a rule, terebinthinates and balsamics, menthol, eucalyptol, terebene, terpin hydrate, and myrtol are the best agents for this purpose, internally or by inhalation. Steam inhalations are to be avoided, but dry inhalations of any volatile oil, of creosote, of well-diluted formaldehyd, or of ethyl iodid are serviceable. No apparatus except a containing phial is usually necessary, but various convenient forms of inhalers are manufactured. When cough is due to ulceration of the larynx, it is to be treated skilfully, as described under LARYNGITIS (Chronic).

Dysphagia, as a rule, is due to ulceration of the epiglottis, which requires local treatment. The food should be semisolid and bolted hastily. Cocain or other local anesthetic may be used with caution before meals. Rectal feeding or feeding through a nasal tube may have to be employed.

Pain in the chest may often be relieved by rubbing in a few drops of a solution containing one or more of the following agents with camphor (liquefaction taking place on mixing): Chloral, menthol, guaiacol, oil of gaultheria. Counterirritation with iodin or croton oil, or even the thermal point, is sometimes necessary.

TUBERCULOSIS, SURGICAL.—See BONES (Diseases), JOINTS (Diseases), LYMPHATIC GLANDS (Diseases), etc.

TUMENOL.—A dark-brown fluid, obtained by treating the unsaturated hydrocarbons of mineral oils with concentrated sulphuric acid. It is said to be a nontoxic and nonirritant protective and palliative to the skin. It is recommended in eczema, excoriations, erosions, superficial ulcerations and burns. The tincture is an efficient application in all forms of pruritus. Tumenol is of no service in erysipelas, and is not a parasiticide.

TUMORS, CLASSIFICATION.*—In deference to the needs of the various registration authorities, a distinction between malignant and nonmalignant new growths is made in the general and local tables. The tumors are here classified, however, according to their structure and the type of normal tissue they most closely resemble. To facilitate returns under the general tables, the malignant growths are marked by two asterisks. In certain cases malignant and nonmalignant growths are unavoidably associated under one head, as, for instance, under sarcoma; the name is then marked with one asterisk.

Cysts are placed in a separate class, and may be returned severally among the local affections of organs; or among new growths, if connected therewith; or as malformations, if congenital; or as parasites, if parasitic.

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* Revised nomenclature of the Royal College of Physicians, 1896.

Class I.—Tumors composed of one of the modifications of fully developed connective tissue.

(The name of the typical normal tissue is printed first in each case; that of the tumor second.)

1. **Adipose Tissue.** Lipoma (fatty tumor).
   (a) Circumscribed.
   (b) Diffuse. *Synonym*, fatty outgrowth.
   (c) Multiple.
   (d) Nevolipoma.
   (e) Fibrolipoma.
2. **Fibrous Tissue.** Fibroma.
   (a) Firm or hard fibroma (desmoid tumor).
   Fibrous epulis.
   Fibrous polypus of nose.
   Fibroma of nerves. *Synonym*, false neuroma.
   Keloid.
   (b) Soft or areolar fibroma.
   Molluscum fibrosum.
3. **Cartilage.** Chondroma.
   (a) Ossifying. *Synonym*, spongy or cancellous exostosis.
   (b) Nonossifying.
   *Enchondroma (when growing in bone).
   Ecchondrosis (when growing from cartilage).
   (c) Myxochondroma (when undergoing mucous softening).
4. **Bone.** Osteoma.
   (a) Developing from cartilage.
   Cancellous or spongy exostosis.
   (b) Developing from membrane.
   Compact or ivory exostosis.
   (c) Of teeth.
   (1) Growing from the cement.
   Dental exostosis.
   Hypertrophy of cement.
   (2) Growing from the dentin.
   Odontoma.
5. **Mucous Tissue.** *Myxoma.
   Mucous polypus.
6. **Neuroglia.** *Glioma.

Class II.—Tumors more or less closely resembling in structure one of the more complex tissues or organs of the body.

(The name of the typical tissue or organ is placed first; that of the tumor second.)

1. **Muscle.** Myoma.
   (a) Unstriped (leiomyoma).
   Fibromyoma, uterine fibroid, fibroid tumor of prostate.
   (b) Striped (rhabdomyoma).
   *Myosarcoma.
2. **Nerves.** Neuroma (true neuroma).
   (a) Medullated.
   Plexiform neuroma (in part). Bulbous nerves.
   Synonym, amputation neuroma.
   (b) Nonmedullated.
3. **Blood-vessels.** Hemangioma, angioma, or nævus.
   (a) Capillary. *Synonyms*, port-wine stain; mother's mark; telangiectasis.
   (b) Venous. *Synonyms*, erectile tumor; cavernous nævus.
   (c) With adipose tissue (nævolipoma).
4. **Lymphatic Vessels.** Lymphangioma, lymphatic nævus, congenital cystic hygroma of neck, macroglossia.
5. **Lymphatic Glands.** Lymphadenoma.
   Hodgkin's disease.
6. **Papillæ of Skin or Mucous Membrane.** Papilloma.
   (a) Squamous papilloma (wart).
   (b) Columnar papilloma (villous growth).
   Of rectum. Of bladder.
7. **Secreting Glands.** Adenoma.
   (a) Racemose adenoma (spaces lined with glandular or spheroid epithelium).
   (1) Resembling normal gland tissue (true adenoma).
   (2) With excess of firm fibrous stroma (adenofibroma; adenoid tumor).
   (3) With stroma of imperfectly developed fibrous tissue (adenosarcoma).
   (4) With stroma containing mucous tissue (adenomyxoma).
   (5) With large cysts throughout the tumor (adenocystosarcoma; cystosarcoma).
   With simple cysts. With intracystic growths.
   (b) Tubular adenoma (spaces in tumor lined with columnar or cubic epithelium).
   (c) Adenoma of ductless glands (thyroid adenoma).
   (d) Ovarian adenoma.

Class III.—Tumors composed of cells of an embryonic type sometimes tending to develop into one of the forms of connective tissue.

*Sarcoma:

1. Composed of small round cells.
   (a) With homogeneous intercellular substance (granulation sarcoma; encephaloid sarcoma).
   (b) With reticulate stroma (lymphosarcoma).
   (c) Ossifying sarcoma (osteoid sarcoma; osteoid cancer).
   (d) Chondrosarcoma (malignant chondroma).
   (e) Gliosarcoma.
2. Composed of large round cells.
   With alveolar stroma (alveolar sarcoma).
3. Composed of oval cells.
   With mucous intercellular substance (myxosarcoma).
4. Composed of large spindle-cells (fibroplastic tumor).
   (a) Ossifying.
   (b) Chondrifying.
5. Composed of small spindle-cells.
   (a) Developing into fibrous tissue (recurrent fibroid tumor).
   (b) Ossifying.
6. Composed of round and spindle cells.
7. Containing giant cells (myeloid sarcoma).
8. Melanotic sarcoma (pigmented sarcoma).
9. Plexiform sarcoma (cylindroma).
10. Psammoma (brain-sand tumor).

Class IV.—Tumors composed of epithelial cells arranged in the spaces of a stroma of more or less perfectly developed and vascular connective tissue.

**Carcinoma, or True Cancer.

1. Glandular or spherical carcinoma.
   (a) With little stroma and abundant vessels (encephaloid cancer).
   (b) With dense fibrous stroma (scirrhus, or hard cancer).
   Variety: Atrophic cicatrical scirrhus.
   (c) With colloid degeneration of cells (colloid cancer—reticular or alveolar cancer in part).
   (d) With a myxomatous stroma (carcinoma myxomatodes).
2. Squamous carcinoma. *Synonyms*, epithelioma; squamous epithelioma.
   Note.—Chimney-sweeper's cancer is to be returned under squamous carcinoma.
3. Rodent cancer or rodent ulcer.
4. Columnar carcinoma. *Synonyms*, Columnar epithelioma; adenoid cancer.
   (a) With colloid degeneration of cells (colloid cancer in part).
   (b) Arising in ducts (duct cancer).
5. Thyroid carcinoma (resembling in structure the thyroid gland).

Class V.—Cysts.

1. **Cysts Arising from the Distention of Preexisting Spaces.**
   (a) *Spaces lined with secreting epithelium* (*retention cysts*).
   (1) Acinous or glandular cyst of breast, pancreas, and other glands.
   (2) Duct cyst of the breast, pancreas, testicle, and other glands.
   (3) Galactocele.
   (4) Spermatocele.
   (5) Mucous cyst Ranula. Labial cyst.
   (6) Sebaceous or atheromatous cyst (wen)
   (7) Ovarian cyst from Graafian follicles.

- (*b*) *Spaces lined with flattened endothelium (distention or exudation cysts; lymphatic cysts).*
  - (1) Bursal cysts.
  - (2) Ganglion.
  - (3) Serous cysts.

2. Cysts in which the Fluid is Contained in a Space of New Formation.

- (*a*) Blood cyst. Apoplectic cyst in brain.
- (*b*) Degeneration cyst. In brain. In tumors.

3. Cysts of Congenital Origin.

- (*a*) Inclusion cyst. Dermoid cyst.
- (*b*) Cysts arising in the remains of fetal structures.
  - (1) Unobliterated branchial clefts.
    Deep cysts of neck.
  - (2) Unobliterated canal of His.
    Sublingual cysts in part.
    Subhyoid cysts in part.
    Cysts in front of larynx.
  - (3) Remains of Wolffian body.
    Encysted hydrocele in male (in part).
    Cysts of the broad ligament in female (in part).
  - (4) Partially unobliterated processus vaginalis testis.
    Encysted hydrocele of cord.
  - (5) Partially unobliterated canal of Nuck.
    Hydrocele of canal of Nuck.
  - (6) Cysts of postanal gut.

4. Parasitic Cysts.

Another classification (by Coplin) gives a clear and schematic arrangement:

TUMORS.

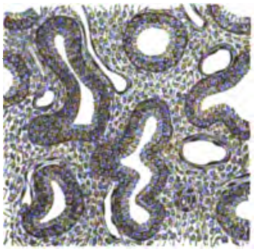
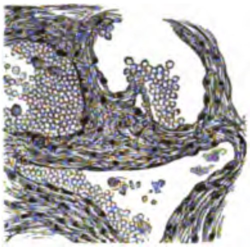
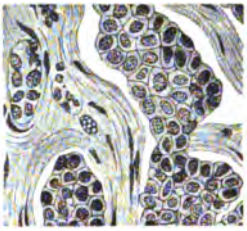
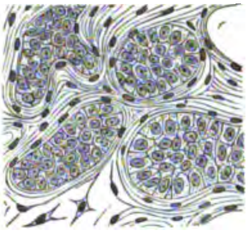
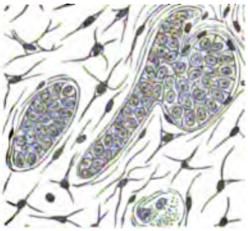
(Those printed in *italics* are malignant.)

- TUMOR
  - Neoplasms
    - Epithelial (Epiblast and Hypoblast)
      - Adult (Typical Benign)
        - Papilloma
          - Skin warts.
          - Villous warts.
          - Intracystic warts.
        - Adenoma
          - Acinous.
          - Tubular.
        - Neuroma
          - Ganglionic neuroma.
          - Myelinic neuroma.
          - Amyelinic neuroma.
        - Glioma
      - *Embryonic* (Atypical, Malignant)
        - *Carcinoma, or Cancer*
          - *Epithelioma*
            - *Squamous.*
            - *Tubulated.*
            - *Cylindric.*
          - *Glandular*
            - *Scirrhus.*
            - *Encephaloid.*
              (*Colloid Mucoid, Melanotic.*)
    - Connective tissue (Mesoblast)
      - Adult (Typical or Benign)
        - Lipoma
          - Simple.
          - Fibrous.
        - Chondroma
        - Osteoma
          - Eburnated.
          - Compact.
          - Spongy.
        - Fibroma
          - Simple
            - Hard.
            - Soft.
          - Fibroma Molluscum.
          - Keloid.
        - Myoma
          - Leiomyoma (Unstriped).
          - Rhabdomyoma (Striped).
        - Angioma
          - Hemangioma (Blood-vessels)
            - Simple.
            - Cavernous.
            - Plexiform.
          - Lymphangioma (Lymph-vessels).
        - Lymphoma (?)
        - Myxoma
      - *Embryonic* (Atypical, Malignant)
        - *Sarcoma*
          - *Round-cell*
            - *Large.*
            - *Small.*
          - *Spindle-cell*
            - *Large.*
            - *Small.*
          - *Myeloid.*
          - *Mixed-cell.*
          - *Alveolar* (*Melanotic, Cystic, etc.*).
    - Mixed........................Teratoma.
      (Both Epithelial and Connective-tissue).
  - Cysts
    - (1) Retention (occluded excretory ducts).
    - (2) Exudation (accumulations in closed cavities).
    - (3) Cystomata (new formation).
    - (4) Extravasation (those forming from extravasations).
    - (5) Dermoid (congenital and due to inversion of the cutis and to imperfectly closed fetal clefts).
    - (6) Parasitic (due to animal parasites).
    - (7) Cysts resulting from necrotic and degenerative changes.

TUMORS, TABLE OF.

NAME.	HISTOLOGIC CONSTITUENTS.	PHYSICAL MANIFESTATIONS.	APPEARANCE OF SECTION.	SIZE.
Adenoma. 1. *Acinous.*	Acini lined with spheroidal epithelium, with varying amount of connective tissue, as in a normal gland.	1. *Acinous.* Firm, rather hard consistence; inelastic; lobulated; light-gray or slightly yellow color; movable; encapsulated; generally single; rounded; when on mucous surfaces, flat and irregular.	Gray or yellowish-white; of variable density; often intermingled with cysts.	1. *Acinous.* Cherry or walnut; in the breast; large.
2. *Tubular.*	Tubules lined with cylindrical epithelium.	2. *Tubular.* Soft; frequently pedunculated; grayish-white or reddish color; translucent.		2. *Tubular.* Small.
Angioma. 1. *Telangiectatic.*	1. *Telangiectatic.* Dilated blood-vessels.	1. *Telangiectatic.* Surface often covered with small, granular elevations, resembling a strawberry; often well circumscribed.	Red color; affecting in part the corium; in part the subcutaneous adipose tissue.	Patch on the skin the size of a millet-seed to several inches in extent.
2. *Cavernous.*	2. *Cavernous.* Spaces lined with endothelial cells and filled with blood, like corpora cavernosa of penis.	2. *Cavernous.* Soft, doughy; nonpulsating; leaden or blue color.		2. *Cavernous* Usually small.
Carcinoma. 1. *Scirrhous* (hard, spheroidal-celled).		1. *Scirrhous.* Hard, irregular, tuberous; adherent to surrounding tissues; ulcerated. Nonencapsulated. *Ulcer.*—Irregular in outline and depth; margins hard, nodular, everted.	1. *Scirrhous.* Firm; white; often traversed by fibrous septa; creaking under the knife; cupped. Scraping exposes a milky fluid, the so-called "*cancer-juice.*"	1. *Scirrhous.* Moderate.
2. *Encephaloid* (soft, spheroidal-celled).	Large epithelial cells containing one or more nuclei, without visible intercellular matrix, grouped into acini (*cancer-nests*). Vessels have walls of normal thickness and constitution, and ramify in the stroma, and not among the cells themselves.	2. *Encephaloid.* Soft, globular, or bossellated; elastic, compressible; fluctuating; nonencapsulated.	2. *Encephaloid.* Resembles brain-tissue.	2. *Encephaloid.* Considerable.
3. *Colloid* (probably a degeneration of one of the preceding varieties).	Three varieties are described histologically: (*a*) squamous, made up of squamous or flat epithelium; (*b*) cylindrical, containing columnar cells; (*c*) glandular, composed largely of polyhedral cells, like those of secreting glands.	3. *Colloid* (usually mucoid). Soft; jelly-like; contains mucoid material; semitranslucent; glistening; at places diffluent.	3. *Colloid.* Amorphous; jelly-like.	3. *Colloid.* Large or small.
Chloroma.	A form of round-celled sarcoma (*which see*).	Small nodules.	Greenish or dirty color on section.	Small.

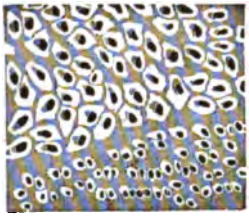
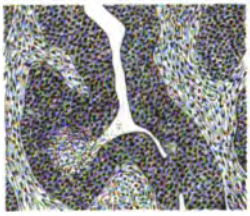
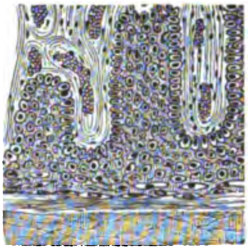
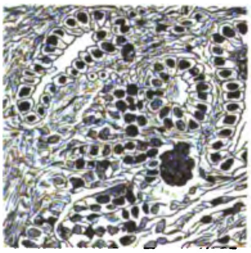
TUMORS, TABLE OF.

Seats of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
1. *Acinous.* Mamma, lip, ovary, testis, prostate, thyroid, parotid, lacrimal gland, sudoriferous and sebaceous glands.	Mucous. Fatty. Colloid. Cystic.	Young adults.	Slow.	Benign; the flat adenoma may become malignant.	Rare.	
2. *Tubular.* Rectum and other portions of intestines; uterus.						
1. *Telangiectatic.* Skin, mucous membrane, brain, bones, and mamma.		Uusally congenital.	Usually slow.	Benign.	Common.	
2. *Cavernous.* Liver, kidney, spleen, uterus, bones, muscle. (*Illustrated*).						
1. *Scirrhous.* Mamma; alimentary tract (especially the pyloric end of stomach); glands of the skin (rare); rectum; uterus.	Horny. Fatty. Cystic. Colloid. Mucoid. Hyaline. Caseous. Pigmentary. Ulcerative. Calcareous (rare).	Adults past 40 years of age.	Slow, but may be rapid.	Malignant. Metastasis takes place by means of the lymphatics, but carcinoma of the stomach and intestines invades the liver by the portal bloodpaths.	Common.	
2. *Encephaloid.* Testicle; ovary; mucous membranes.						
3. *Colloid.* Stomach; intestine; ovary; mamma; thyroid. (*The illustration is of Myxomatous Carcinoma.*)						
Periosteum of skull.	Fatty.	Young adults.	Rapid.	Malignant.	Rare.	Same as *Round-celled Sarcoma.*

TUMORS, TABLE OF.

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Cholesteatoma.	Concentric layers formed of flat cells of an epithelial character, arranged in whorls enclosing cholesterin plates. Belongs probably to the *Teratomata* from the occurrence in it of sebaceous glands, hair-follicles, etc.	Solitary or multiple nodules or nodes.	Shining, glistening.	Small.
Chondroma. (*Enchondroma.*)	Hyaline or fibro-cartilage, with few blood-vessels. The cells are arranged irregularly and have irregular shapes, many being stellate or spindle-shaped.	Hard; elastic; nodular or lobulated, sometimes smooth; round; encapsulated; usually single, but may be multiple and symmetric.	Homogeneous or coarsely granular; translucent; bluish-gray or pinkish-white; often marked by connective-tissue septa.	Small if multiple; large if single.
Endothelioma.	Multiplication of endothelial cells lining lymph-passages. A variety of sarcoma. Large, round cells containing one or two nuclei. Resembles epithelial new-growths.	Circumscribed or extensive flat growths, spreading over the serous membranes; white in color.		Small nodules or extensive infiltration.
Epithelioma. 1. *Squamous.*	Composed of pegs or columns of cuboidal epithelial cells which first infiltrate the subjacent connective tissue, then every underlying structure, including bone, in their track. These ingrowths contain the *cell-nests, epidermal pearls, or pearly bodies.*	Dense; inelastic; nonencapsulated; ulcerated; edges of ulcer indurated.	1. *Squamous.* White; dense; homogeneous; poor in juice; when scraped a gruel-like material is obtained, which consists of plugs of cells and individual cells.	
2. *Cylindric-celled* or *columnar-celled.*	Originates either from the cylindric surface-epithelium of a mucous membrane, or from that of glands lined by columnar epithelium. Contains no "cell-nests." Consists of alveoli containing cylindric cells at the periphery, and irregular cells in the center. Presents the character of adeno-carcinoma.	Soft, infiltrating masses or nodes, or papillomatous growths.	2. *Cylindrical.* Soft, juicy; gelatinous if mucoid or colloid.	

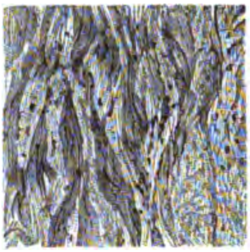
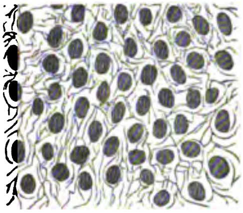
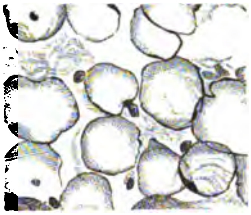
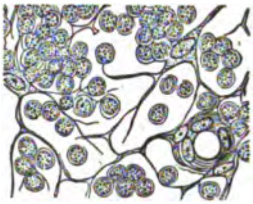
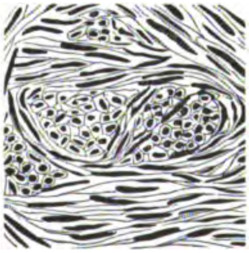
TUMORS, TABLE OF.

SEATS OF PREDILECTION.	DEGENERATION TO WHICH SUBJECT.	AGE.	GROWTH.	NATURE.	FREQUENCY.	ILLUSTRATIONS. (*From Ziegler and Woodhead.*)
Brain and meninges.				Nonmalignant.	Rare.	
The bones, especially on or in the phalanges; scapula, ilium, upper jaw; subcutaneous tissue; salivary glands (parotid); testicle; bronchial cartilages.	Fatty. Mucoid. Calcareous. Cystic.	Usually in the young.	Slow or rapid.	Benign; may assume malignant characteristics.	Common.	
Pleura and peritoneum; membranes of brain.		Young adults	Rapid.	Malignant.	Very rare.	
1. *Squamous.* Nose, lower lip, penis, scrotum, vulva, anus, tongue, gums, palate, tonsils, larynx, pharynx, esophagus, bladder, os uteri, hands and feet (rare).	Horny. Ulceration.	After 40.	Slow or rapid, according to situation.	Malignant. Late metastasis.	Common.	
2 *Cylindrical.* Stomach; intestinal tract; uterus; gall-bladder; biliary passages; respiratory tract.	Mucoid. Colloid.	In uterus before 40.	Varies in its rapidity.	Malignant. Late metastasis.	Quite common, especially in digestive tract.	

TUMORS, TABLE OF.

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Fibroma.	1. *Hard.* White, fibrous tissue, consisting of fibers and few connective-tissue corpuscles; blood-vessels few. 2. *Soft* Few fibers, many cells..........	1. *Hard.* Ovoidal or spherical; lobulated; nodular or bossellated; pedunculated or sessile; firm, elastic; encapsulated; glistening white, yellowish, or slightly red color; unattached to overlying tissues; single or multiple. 2. *Soft.* Soft, compressible; sessile or pendulous; single or multiple; encapsulated.	1. *Hard.* Smooth, glistening, firm; grayish-white color. 2. *Soft.* Moist, not so glistening; more reddish.	From a grain of shot to fetal head or much larger.
Glioma..........	Round cells, with large nuclei, embedded in a scanty, granular, intercellular substance. After the type of the neuroglia of the brain.	Soft, gelatinous, glue-like tumor; not distinctly outlined; somewhat translucent. Usually single.	Like brain-tissue, but usually a little harder and more reddish in color.	Small, rarely larger than a fist.
Lipoma.........	Adipose tissue (fat-vesicles larger than normal) bound together by delicate connective tissue.	Circumscribed; lobulated, soft, doughy, pseudo-fluctuating, inelastic; attached to the skin—hence dimpled; ovoidal, spherical, or flattened; occasionally pedunculated; usually surrounded by a thin capsule; usually single; when multiple, usually hereditary.	Like adipose tissue...	From size of hickory-nut to very large size.
Lymphangioma..	Aggregation of dilated lymphatic vessels and lymph-spaces supported by connective tissue.	Soft, doughy, transparent sacs or vesicles, filled with lymph; often feels like a series of tangled cords.	....	From a cherry to fetal head.
Lympho-sarcoma.	Hyperplasia of the lymphoid cells of the lymphatic glands.	Glands for a time preserve their shape, but soon extends to neighboring tissues.	....	Large.
Myoma. 1. *Leiomyoma.*	Smooth, non-striated, muscular fibers, such as occur in the uterus, with varying quantities of fibrous tissue; few blood-vessels. The fibers are composed of spindle-shaped cells containing large, rod-shaped nuclei.	Rounded or pyriform, well-circumscribed; hard; firm; smooth or nodular; white or flesh-colored; encapsulated or non-encapsulated; often multiple.	A striated appearance as in the fibroma.	Often quite large.
2. *Rhabdomyoma.*	Striated muscular fibers, often undeveloped, being spindle-shaped, and associated with sarcomatous tissue.	Large roundish masses or small nodules.	....	Very large if in kidney; small in heart.

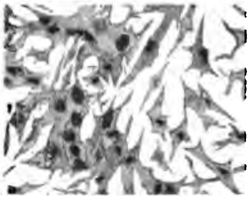
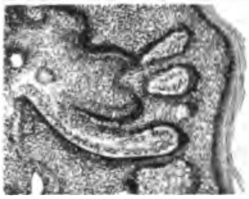
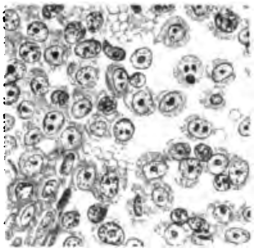
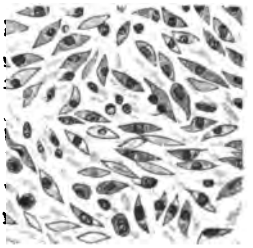
TUMORS, TABLE OF.

Seat of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
Uterus; periosteum; ovary; labium majus; mamma; testicle; tendons; aponeurosis; neurilemma of nerves; around articulations; subcutaneous tissue; rectum.	Ulceration. Calcification. Myxomatous. Fatty. Telangiectatic.	Chiefly in adults from 35 to 55 yrs. of age.	Slow	Benign......	Very common.	
Brain; retina; spinal cord; optic and auditory nerves; suprarenal capsules.	Mucoid. Fatty. Calcareous. Telangiectatic.	Particularly in children.	Slow	Benign, except in the eye, where it is usually combined with sarcoma.	Rare......	
Back of neck; shoulders; back; nates; inside of arm and thigh; submucous and subserous connective-tissue.	Calcareous. Myxomatous. Cystic. Inflammation. Ulceration (rare).	Chiefly during adult life.	Slow.....	Benign......	Very common.	
Posterior and inner surfaces of thigh; genitals; anterior abdominal wall, neck, nates, axillæ, groin, penis, tongue, cheeks, lips, liver, kidney.	....	Usually congenital.	Slow	Benign	Rare.	
Neck, groin, axilla, mediastinum, etc.	....	Young adults.	Rapid....	Very malignant.	Rare.	
Uterus, esophagus, intestine, prostate, stomach.	Calcareous. Fatty. Myxomatous. Cavernous.	Mature or advanced life.	Slow......	Benign......	Very common.	
Kidney, ovary, testicle; tongue, heart.	....	Congenital.	Rapid....	Malignant in the segmental organs and kidney, ovary, testicle when combined with sarcoma.	Rare.	

TUMORS, TABLE OF.

Name.	Histologic Constituents.	Physical Manifestations.	Appearance of Section.	Size.
Myxoma........	Delicate network of stellate cells enclosing a mucoid intercellular substance. *Type*—Wharton's jelly; vitreous humor.	Round or lobular; soft, gelatinous; semi-translucent; encapsulated; elastic; may be fluctuating.	Pinkish or yellowish-gray, exuding a glairy fluid, or a trembling, gelatinous mass.	Usually small.
Neuroma.......	Medullated or non-medullated nerve-fibers. Very rarely may contain ganglionic cells; usually combined with fibrous tissues.	Spheric, ovoid, oblong, or bulbous; sometimes plexiform; firm; painful on pressure; few or many (even hundreds).	Often resembles fibroma.	Small.
Osteoma........	Osseous tissue (cancellous or compact bone).	Hard; often lobulated; sometimes spheric; may be spinous or spiculated; pedunculated or sessile; usually single; may be multiple and symmetric.	Like bone-tissue......	Variable; grain of coffee to cocoanut.
Papilloma.......	Hypertrophied papillæ of the skin; varying amount of connective tissue surrounding two or more central blood-vessels, and covered by several layers of epithelial cells.	Circumscribed; hard (on the skin); soft (on mucous membrane); surface smooth, brush-like, or cauliflower-like; single or multiple.	....	Usually small; may be large.
Psammoma.....	A form of sarcoma (*nest-celled*). Connective tissue composed of flat, elongated cells of great size and in which are embedded gritty concretions that are composed of calcium carbonate.	Hard, circumscribed; light color.	White; gritty on section.	Small.
Sarcoma.				
1. *Round-celled*..	Embryonic or immature connective tissue. Blood-vessels without walls, or thin-walled, ramifying among the cells. Small or large round cells, embedded in a small amount of granular or homogeneous intercellular substance.	Soft; vascular; whitish; somewhat translucent; on pressure after some hours exudes a milky fluid; round or ovoid, or oblong.	Resembles brain-matter; of a yellow, gray, or brick-dust hue.	Often very large.
2. *Spindle-celled*.	Cells varying much in size, spindle-shaped, with long, fine tapering extremities, separated by very little intercellular substance. Often have a fibrous appearance (Recurrent Fibroid).	Firm; reddish; does not exude milky fluid. Shape as foregoing.	Fibrous or flesh-like aspect; pinkish color.	May be large.

TUMORS, TABLE OF.

SEAT OF PREDILECTION.	DEGENERATION TO WHICH SUBJECT.	AGE.	GROWTH.	NATURE.	FREQUENCY.	ILLUSTRATIONS. (*From Ziegler and Woodhead.*)
Nasal cavities; mamma; intermuscular spaces; submucous and sub-serous tissues; back; thighs; lip; cheek; labia; clitoris; prepuce; scrotum; axillæ; parotid; ear; more rarely periosteum, bone, heart, and nerve-sheaths.	Fatty. Ulceration. Telangiectatic.	Any age; may be congenital.	Slow.....	Benign......	Common.	
Cut ends of nerves, as in stumps of amputation, on skin.			Slow.	Benign.	Somewhat rare.	
Cranial bones, maxilla, orbit; ends of phalanges; juxta-epiphyseal portions of long bones (tibia, femur, humerus, etc.); dura mater; muscle; aponeurosis; lungs.		Congenital or early life.	Slow.	Benign.	Not common.	
Skin of hands and genitalia; larynx; bladder; rectum; nose.		At all ages.	Slow or rapid.	Benign.	Common.	
Membranes of brain, choroid plexus; pineal gland; spinal cord; nerves.	Calcareous.	Early life.	Rapid.	Malignant.	Rare.	
Periosteum; bone; lymphatic glands; subcutaneous tissue; testicle; eye; ovary; lungs; kidneys; intermuscular septa.	Mucoid. Fatty. Ulceration. Calcareous. Ossification. Telangiectatic. Cystic.	Youth, or before 35th year.	Very rapid.	Malignant. Early metastasis. Dissemination by the blood-vessels and not by the lymphatics.	Common	
Subcutaneous tissue; fasciæ and intermuscular septa; periosteum; interior of bones; eye; antrum; breast; testicle.	As foregoing.	As foregoing.	Rapid.	Malignant by recurrence.	Common.	

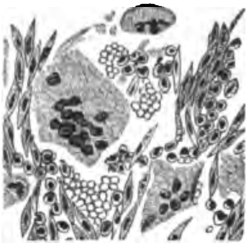
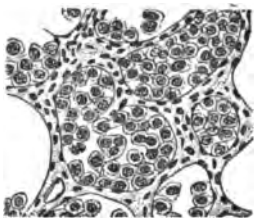
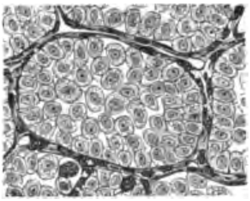
TUMORS, TABLE OF.

NAME.	HISTOLOGIC CONSTITUENTS.	PHYSICAL MANIFESTATIONS.	APPEARANCE OF SECTION.	SIZE.
Sarcoma (*Contd.*)				
3. *Giant-celled* (*Myeloid.*)	Masses of protoplasm containing two or more nuclei—up to 20 or 50—with a varying amount of round and spindle cells.	Jelly-like consistence or firm, like muscle. Shape as foregoing.	Smooth, shining, succulent; no appearance of fibrillation; greenish or livid red or maroon color, varied by pink or darker red spots, due to extravasation of blood.	Large.
4. *Alveolar.*	Alveolar space filled with sarcoma cells; the trabeculæ composed of spindle-cells.	Very vascular; soft		Small or large.
5. *Melanotic.*	Sarcomata of various kinds in which brownish or black pigment becomes deposited as amorphous granules in the cells as well as the connective tissue and blood-vessel walls of the tumor.	Rounded, nodular, dark colored tumors of varying size and consistency, usually hard.	Brownish or black.	May be large.
Dermoid Cyst....	Cyst wall contains hair-follicles and sebaceous glands. *Contents.*—Disintegrating epithelial cells, hair, sebaceous matter, teeth, etc.	Globular; tense; smooth; freely movable		May be large.

TUMORS, ETIOLOGY.—It is not improbable that different tumors arise as a result of the action of various causes. As, however, we know very little concerning the exact etiology of any particular tumor, certain general considerations are permissible. The older theories, attributing the occurrence of tumors to alterations in the humors of the body, particularly of the blood, and similar hypotheses, may be at once discarded. The following hypotheses are deserving of consideration:

1. *The Durante-Cohnheim Inclusion Theory.*—This theory is based upon the supposition that, during embryonic development and the specialization of the cells entering into the formation of organs and adult tissues, more embryonic elements are produced than are necessary, and that these cellular elements become quiescent in the tissues, where they may remain, constituting embryonic "rests" or "remnants," from which, later, tumor formation takes place. Such embryonic rests or remnants would be exceedingly likely to occur where developmental processes are complex, as, for example, where different forms of epithelium join. Such points of tumor election undoubtedly occur, as is shown by the development of cancer at the various orifices of the body and at points of epithelial transition, such as the lip, cervix uteri, etc. This theory also explains to advantage the occurrence of chondroid tumors in or from bone, and of melanotic sarcomata from quiescent pigmented cells in moles, and affords a most acceptable explanation for the development of dermoid cysts. The theory, however, is wanting in several ways. In the first place, admitting the occurrence of these remnants, it would appear that a further etiologic factor is necessary in order to stimulate them to renewed activity. Another objection is afforded by the fact that many localities in which complex developmental processes occur, such as the heart and the nervous system, are singularly free from tumors, and that when they do occur in such tissue, they are not commonly situated at points at which the complexity of development is most marked. Epithelial rests are sometimes demonstrable, and yet no tumor formation occurs. The occurrence of tumors as

TUMORS, TABLE OF.

Seat of Predilection.	Degeneration to which Subject.	Age.	Growth.	Nature.	Frequency.	Illustrations. (*From Ziegler and Woodhead.*)
Lower and upper jaw; lower end of femur; head of tibia.		Usually in adults over 40.	Slow.	Comparatively benign. Metastasis rare.	Rarer than the preceding forms.	
Skin; eye; bone; lymphatic glands, pia mater of brain. Often springs from warts.		In the young.	Rapid.	Malignant.	Rare.	
Where pigment occurs normally; the eye and the skin, the pia; secondarily, especially in the liver.	As other sarcomata.	As other sarcomata.	Usually rapid.	Very malignant.	Common.	
Outer angle of orbit; over root of nose; ovary; testicle.		Congenital.	Slow	Benign.	Common.	

the result of trauma (to be considered later) is inconsistent with this theory.

2. *Injury and inflammation* appear to be, in a certain percentage of tumors, important etiologic factors. Persistent or long-continued irritation seems to favor the development of tumors belonging to the epithelial group. As examples of such tumors the following may be mentioned: Carcinoma of the scrotum in chimney-sweeps; epithelioma of the arm in workers with paraffin and tar; smokers' cancer of the lip or tongue and cancer of the tongue apparently due to injury by a carious tooth; and epithelioma originating in the margins of chronic ulcerative processes. Among the nonmalignant epithelial tumors the development of which appears to be favored by injury or irritation may be cited the papillomatous masses due to the accumulations of irritating discharges, particularly around the anus and external genital organs, when the parts are not kept properly cleansed. Sarcoma following fracture or injury of bone, and fibroneuromata of the severed ends of nerves after amputation, may be mentioned as connective-tissue tumors offering strong support to this theory. The occurrence of tumors at points particularly liable to injury is another argument in its favor.

Numerous objections have been made to the acceptance of this theory. In about 85 percent of all tumors no history of injury can be obtained. On the other hand, the frequency with which injuries are received is out of all proportion to the total number of tumors occurring. Parts particularly subject to injury, such as the hands and feet are not commonly affected,and the nipple, which is frequently injured, is rarely the seat of a tumor.

3. *Parasitic Influence.*—The germ theory has been invoked to explain the formation of tumors, particularly the malignant neoplasms, in which metastases are conspicuous. By some the essential parasitic body is believed to be an animal parasite belonging to the protozoa and resembling, if not identical with the coccidia. Others believe that the infecting body is a vegetable organism belonging to the blastomycetes. In further sup-

port of the parasitic origin of tumors the demonstrable autoinoculability of cancer is adduced. Thus, it has been shown that cancer of one labium may attack the point of contact upon the opposite labium; cancer of the cervix may attack the contiguous vaginal vault; and cancer reaching the peritoneal surface may show a similar inoculability.

4. *Parasitism of Cells.*—It is not impossible that normal cellular elements may take on a certain parasite-like property that, in the presence of reduced resistance afforded by other elements, permits of their extension beyond normal limits. Thus, in cancer cellular elements that we believe to be of epithelial origin are found abundantly infiltrating connnective tissues. Normally, epithelium does not so extend, nor, in most instances, even when introduced experimentally, does it acquire any such property. Should further experiment show that conditions may arise under which epithelium can acquire or manifest the faculty of intraconnective-tissue growth, without the intervention of any other factor, we may assume that the manifestation of this parasite-like character leads to the development of cancer.

5. Adami presents a most fascinating argument in favor of his view that whatever may be the origin of tumors, the most important element in their production is the fact that the cells forming the neoplasm give up the habit of function and acquire the *habit of growth.* Reproduction is of course an essential function in all cells, but in addition to proliferative power every cell is endowed with the inherent capacity to perform some specific duty, in the consummation of which it utilizes more or less of the energy that it is able to transform from the nutrition supplied. If the cell ceases to perform this specific function, whatever that duty may be, the energy previously converted in that direction is now transferred to the reproductive capacity of the cells, thereby leading to proliferaton in excess of the normal. The originator of this suggestive hypothesis fully recognizes the necessity for some reason accounting for the cell's acquisition of the habit of growth at the expense of the habit of function. The fact that malignant neoplasms of epithelial origin, and particularly those arising from the mammary gland and uterus, appear at a time when function is on the decline, is fully in support of Adami's view. He further maintains that irritation, parasitic or otherwise, may so modify the cell that proliferation becomes excessive and secretion or other specific function proportionately diminishes.

6. *Predisposing Causes.*—The foregoing brief consideration of the most plausible reasons advanced to explain neoplastic growths indicates our ignorance of the essential etiologic factor in tumor formation. There are, however, certain predisposing elements worthy of consideration. Some of the conditions previously considered may be active only in this way. Trauma and inflammation may predispose to tumor formation. just as they predispose to infection, and long-continued irritation or prolonged ulceration may act only as predisposing elements. With regard to age, it may be said, in a general way, that physiologic activity favors the development of sarcoma, while senescence, or physiologic decline, predisposes to the occurrence of cancer (Da Costa). The influence of inheritance cannot be entirely ignored, although it is probably slight (Coplin).

TUMORS, TREATMENT.—See special articles, BONES, BREAST, CARCINOMA, EPITHELIOMA, SARCOMA, STOMACH, UTERUS, etc.

TURPENTINE (Terebinthina).—A turpentine means a vegetable exudation, liquid or concrete, consisting of resin combined with a peculiar essential oil named *oil of turpentine*, $C_{10}H_{16}$, and generl ally procured from various species of the naturaorder Pinaceæ. Of the many turpentines two only are official, viz.—

Terebinthina, *Turpentine*—a concrete oleoresin from *Pinus palustris*, the yellow pine, and other species of *Pinus*. It occurs in tough, yellowish masses, brittle when cold, crummy-crystalline interiorly, of terebinthinate odor and taste. Dose, 5 to 30 grains as a stimulant, antispasmodic or diuretic; 2 to 4 drams as an anthelmintic.

Terebinthina Canadensis, *Canada turpentine* (*balsam of fir*)—a liquid oleoresin obtained from *Abies balsamea*, the silver fir or balm of Gilead. A yellowish, transparent, viscid liquid, of agreeable, terebinthinate odor and a bitterish and slightly acrid taste, slowly drying on exposure, forming a transparent mass; completely soluble in ether, chloroform or benzol. Dose, 10 to 30 grains.

Turpentines are stimulant, diuretic, anthelmintic, and hemostatic; in large doses laxative and irritant, and externally used are rubefacient and antiseptic. Their virtues depend entirely on the volatile oil.

Oil of turpentine is employed externally as a rubefacient and counterirritant in many conditions producing pain and inflammation. Cloths wrung out of hot water and then sprinkled with the oil (turpentine stupes) are useful applications in sciatica and other neuralgias, lumbago, chronic rheumatism, chronic bronchitis, peritonitis with tympanites, pleurisy, and renal colic. It is one of the most efficient agents in hospital gangrene, applied in full strength to the part affected. The liniment is in constant use for sprains, neuralgia, and other slight local affections.

Internally it is best employed in ulceration and hemorrhage of the intestines and in passive hemorrhages from other organs. Active bleeding with a plethoric condition and hematuria are states in which it is contraindicated. It is often used with ether (1 to 3) in biliary and flatulent colic as an anodyne and antispasmodic.

Preparations.—Oleum Terebinthinæ, $C_{10}H_{16}$, commonly called Spirit or Spirits of Turpentine, is a volatile oil distilled from turpentine. A thin, colorless liquid of characteristic odor and taste; soluble in 3 times its volume of alcohol, mixes with other volatile and fixed oils, and dissolves resins, wax, sulphur, phosphorus and iodin. It is a mixture of several hydrocarbons (*terpenes*), each having the same formula as itself. **Oleum Terebinthinæ Rectificatum,** prepared by shaking oil of turpentine with an equal volume of solution of sodium hydroxid, distilling three-fourths, and separating. This preparation should always be dispensed when oil of turpentine is required for internal use. Dose, as a stimulant or diuretic, 5 to 25 minims, in emulsion 3 to 6 times daily; as a cathartic or anthelmintic 4 drams or more, combined with other cathartics. A little glycerin and oil of gaultheria will disguise the taste. **Emulsum Olei Terebinthinæ** has of the rectified oil 15, expressed oil of almond 5, syrup 25, acacia 15, water to 100. Dose, 1/2 to 2 drams. **Linimentum Terebinthinæ,** *Turpentine Liniment,* has 35 parts of the oil of turpentine with 65 of resin cerate.

TUSSOL.—Mandelate of antipyrin. Tussol combines the antipyretic, analgesic and sedative action of antipyrin with the stimulant action of mandelic acid on glandular secretions. It is recommended in whooping cough. Dose, 1/2 to 8 grains according to the age of the patient.

TWIN BIRTHS.—See LABOR, PREGNANCY (Multiple).

TWITCHING.—See BLEPHAROSPASM, CHOREA, TREMOR.

TYMPANIC INFLATION.—See EAR (Examination).

TYMPANITES.—The symptom which is popularly known as "drum belly," a distention of the abdominal walls caused by paralysis of the muscular coat of the intestines and their inflation with gas. In slight degree tympanites accompanies all forms of chronic gastric and intestinal disturbance. It is due partly to the formation of gas and partly to the paralytic condition of the intestinal walls. In acute intestinal obstruction and in intussusception tympanites is not marked. Indeed, in the latter disorder there may be marked depression and sinking instead of distention due to flatus. In peritonitis tympanites may be the occasion not only of discomfort, but also of danger to life. In intestinal tuberculosis tympanites is due to loss of tone of the muscular walls of the gut; and it may also occur in long-standing cases in which adhesions have taken place between the visceral and parietal layers. In typhoid fever tympanites of moderate grade is a frequent but not a serious symptom, but it is of grave import when excessive. The walls of the gut become infiltrated with serum, and gas accumulates in the small and large intestines, particularly in the latter. When extreme, the diaphragm is compressed and the action of the heart and lungs is very much interfered with. Tympanites undoubtedly favors perforation.

Treatment must be directed to the cause. When due to obstruction by cancer, operation being contraindicated, the aspirating needle may be plunged through the abdominal wall. This procedure is not altogether free from danger, and, as a rule, affords little relief. The long tube introduced high up into the rectum is almost useless. It may be necessary to make an opening in the middle line of the abdomen and to secure the first coil of distended intestine and open it, leaving it *in situ* in the abdominal wall. Of drugs, asafetida is used as a carminative, affecting chiefly the lower bowel. In the intestinal indigestion of the aged, when associated with flatulence, and in the flatulent colic of children, asafetida is efficient. By rectal injection this drug is of much value in the tympanites of children and in that of adults in typhoid fever. The following pill is useful for flatulence in the aged:

℞.	Extract of nux vomica,	gr. v
	Extract of physostigma,	gr. iij
	Asafetida,	gr. xl.

Divide into 20 pills. Give 1 pill night and morning.

For speedy results in nonchronic cases, 30 minims of the aromatic spirit of ammonia may be tried, or brandy may be given. Hoffmann's anodyne, in combination with the compound tincture of cardamom, is often effective. Turpentine, creosote (alone or combined with galbanum), musk, ammonia, alcohol, charcoal, ginger, capsicum, cajuput, and peppermint may be administered.

TYMPANUM.—See EAR (Diseases).

TYPHLITIS.—A catarrhal inflammation of the mucous membrane of the cecum and ascending colon; it is characterized by pain, tenderness, constipation, and in certain cases by a characteristic vomiting. In the majority of cases it is due to the accumulation of feces in the cecum.

Symptoms.—Pain and tenderness in the right iliac fossa and along the ascending colon, with some prominence of this region; the bowels are distended with gas (meteorism) and are usually constipated, or small liquid stools may occur from time to time, due to the accumulation of hardened feces in the sacculated periphery of the cecum, leaving a central canal, through which the liquid contents of the upper bowel can pass. In severe cases the local pain, tenderness and swelling are greater and there is impaction of feces. There are decided fever, restlessness, and also nausea and vomiting. The vomited matters consist at first of the contents of the stomach, then of the duodenum, with bilious matter, and, ultimately, if the impaction persists, of material having the odor of feces. With these symptoms occurs great depression of the vital powers. Peritonitis is finally developed by contiguity of tissue or by rupture of the bowel.

The temperature, even in mild cases, is one or two degrees above the normal, and in some cases an eruption is seen upon the abdomen, consisting of one or two dark red spots the size of a pinhead, which are of short life and disappear on pressure.

The mild form lasts about one week. The severe form may terminate in subacute peritonitis, continuing about two weeks.

Diagnosis.—The mild form is distinguished from other intestinal affections by the localized pain, by tenderness and prominence, and by the constipation.

The severe form can only be distinguished from the other forms of intestinal obstruction by the history of the case and of the attack, and by the results of treatment.

The prognosis in the mild form is favorable. In the severe form it is grave, although not necessarily hopeless.

Treatment.—The patient should be kept in bed, and receive a strictly milk diet in very limited amounts for a few days. If the pain and suffering are intense, a hypodermic injection of morphin should be immediately administered.

For the removal of the impacted feces, which in the majority of cases is the cause of the inflammation, use the following:

℞. Magnesium sulphate,	ʒ xij
Dilute sulphuric acid,	ʒ ij
Tincture of opium,	ʒ iv to vj
Spirit of chloroform,	ʒ ij
Peppermint water, enough to make	℥ iij.

One teaspoonful every hour, diluted.

The following should be useful in some cases:

℞. Calomel,	gr. ij
Sodium bicarbonate,	gr. xxiv
Sugar of milk,	ʒ ss.

Make 12 powders. Give 1 every hour until 12 have been taken, followed by 4 ounces of hot Hunyadi János water.

In severe cases opium is to be immediately given by hypodermic injections of morphin guarded with atropin, continued until all symptoms of inflammation have subsided, when attempts to remove the accumulated feces may be made by irrigation of the bowel with warm soapsuds and by the cautious administration of magnesium sulphate in dram doses every 2 hours. Locally, hot, dry applications or the ice-bag may be used. See Appendicitis.

TYPHOID FEVER (Enteric Fever). Definition.—A general infection, caused by the bacillus typhosus, characterized anatomically by hyperplasia and ulceration of the lymph follicles of the intestines, swelling of the mesenteric glands and spleen, and parenchymatous changes in the other organs.

Period of Incubation.—From 8 to 23 days.

Etiology.—The disease is widely distributed throughout the world, and especially prevails in temperate climates. Contaminated water, milk or food such as oysters bedded near sewer exits, or green vegetables fertilized by means of sewage or washed with infected water, and defective drainage are the most important factors in the etiology. It is most prevalent in the autumn months. Young adults are most prone to be attacked. Males and females are equally affected. Idiosyncrasy plays a rôle in some families. The typhoid "carrier" is an important factor in the dissemination of the disease.

Description of Bacillus Typhosus.—A rather short, thick, flagellated, motile bacillus with rounded ends; it grows readily on nutritive media, and can be distinguished from the colon bacillus, which it closely resembles. It stains well with the ordinary anilin dyes. To stain for bacilli in tissues, allow the specimen to remain in Loeffler's alkaline methylene-blue solution for from 15 minutes to 24 hours, wash in water, dehydrate rapidly in alcohol, clear up in xylol, and mount in Canada balsam.

The Bacilli Outside the Body.—In drinking-water they retain their vitality for weeks, and in the soil for months. They are not destroyed by freezing.

Modes of Conveyance.—By "food, fingers, and flies" mainly.

Modes of Infection.—While infection usually takes place through the intestines, the researches of Chiari, Kraus, Hodenpyl, Flexner, and others, show that even in the early stages the bacilli are widely distributed throughout the system.

In the immense majority of cases of typhoid fever marked enteric lesions are present, but exceptionally the disease is one in which there is a general infection, without special local manifestations; or the localizations may be other than enteric; or there may be a mixed infection of the typhoid bacillus with the colon bacillus, streptococcus, staphylococcus, pneumococcus, or bacillus of tuberculosis. In the tropics, more rarely in temperate regions, typhoid fever occurs in persons already affected with malaria.

Bacillus Typhosus.
Pure culture containing a few irregular forms.—(*Coplin.*)

Morbid Anatomy. Intestines. *Hyperplasia.*—The glands of Peyer in the jejunum and ileum, and to a variable extent those in the large intestine, are swollen, grayish-white in color, and may project to a distance of from 3 to 5 mm. This condition may disappear by a fatty and granular change in the cells, which are destroyed and subsequently absorbed, or it may pass on to—

Necrosis and Sloughing.—When the hyperplasia of the lymph follicles reaches a certain stage, resolution is no longer possible. The blood-vessels become choked, there is a condition of anemic necrosis, and sloughs form, which are subsequently thrown off. The process has a predilection for the area nearest the ileocecal valve.

Ulceration.—The separation of the necrotic tissue—the sloughing—is gradually effected from the edges inward, and results in the formation of an ovoid ulcer, the floor of which is formed by the submucosa and muscularis. The edges are usually swollen, soft, sometimes congested, and often undermined. These ulcers of the intestine are characteristic, and can be ***differentiated from tubercular ulcers*** in the same situation, as follows:

In the **typhoid ulcer** (1) the main axis of the ulcer lies parallel with that of the intestine; (2) it lies opposite to the mesenteric attachment; (3) it has smooth floor and undermined edges; (4) it commonly leads to perforation. In **tubercular ulcer** (1) the long axis of the ulcer lies at right angles to that of the intestine; (2) it is not necessarily situated opposite the mesenteric attachment; (3) its floor is not smooth nor are its edges undermined, but rather funnel-shaped and irregular; (4) it is not apt to perforate, but it does not tend to heal, rather to spread.

Healing begins by the formation of granulation tissue at the base of the ulcer. The mucosa extends from the edge, and a new growth of epithelium is formed. Later the glandular elements are restored.

Perforation of the Bowel.—In 2000 autopsies performed in Munich perforation occurred in 114 instances, or 5.7 percent. In 80 autopsies performed at the Montreal General Hospital perforation was present in 22 cases. Perforation generally occurs within the last foot of the ileum. Multiple perforations may be present.

The mesenteric glands are greatly swollen, and spots of necrosis or suppuration may occur.

The spleen is invariably enlarged in the early stages of the disease, and rupture may occur spontaneously or as the result of trauma.

The liver shows signs of parenchymatous degeneration. Early in the disease it is hyperemic, and in a majority of instances is slightly swollen. Microscopically, the cells are very granular and are loaded with fat.

The gall-bladder not infrequently contains a pure culture of the bacilli, and acute cholecystitis is not very uncommon.

The kidneys show a degree of cloudy swelling, with granular degeneration of the cells of the convoluted tubules.

Ulceration of the **larynx** has been noted in a considerable number of cases.

Changes in the Circulatory System.—Endocarditis is rare, as is also pericarditis. Myocarditis is more frequent. *Inflammation of the arteries*, with formation of thrombi, may take place, and bacilli have been found in them. Thrombosis of the femoral vein is common; most frequently on the left side.

Disposition of Bacilli in the System.—Typhoid bacilli have been found in the blood, in the spleen, in the liver, in the vegetations on the valve leaflets, in thrombi, and in the exudation from the meninges. They are always present in the affected areas of the bowel.

Symptoms. First Week.—The onset is rarely abrupt. Prodromal symptoms are generally present over a period of several days, and are manifested by a feeling of restlessness, vague pains, faint rigors, nausea, loss of appetite, pains in the head, back, and limbs, and nose-bleeding. The bowels may be constipated or diarrhea may be present; most frequently the latter.

There is a steady rise of temperature to 103° or 104° F. The pulse is rapid (100 to 110), full in volume, of low tension, and dicrotic. At this time there may be mental confusion, particularly at night. Toward the end of the first week the spleen becomes enlarged and a rash appears in the form of discrete, rose-colored spots, slightly elevated, and first seen on the abdomen. They disappear on slight pressure. The spots may also be found on the chest and back, and occasionally on the limbs and face.

Second Week.—The fever becomes higher or remains steady, the pulse is rapid and loses its dicrotic character, the face has a dull appearance, mental activity is slow, and the lips and tongue may get dry. The abdominal symptoms, if present, are diarrhea, tympanites, and tenderness. Hemorrhage or perforation may occur. In mild cases there is a gradual decline of the fever to the normal after the fourteenth day.

Third Week.—The temperature shows marked morning remissions, with a gradual decline. The pulse ranges from 110 to 130. Diarrhea and meteorism may now occur for the first time, and there is a special liability to hemorrhage and perforation.

Fourth Week.—The morning temperature has usually reached normal, but there is an evening exacerbation of one or more degrees, the diarrhea stops, the tongue becomes clean, and there is a craving for food.

The fourth week generally marks the beginning of convalescence. In aggravated cases the disease may continue over a period of 5, 6, or even 8 weeks.

The Fever.—In the stage of the invasion the fever steadily rises during the first 5 or 6 days. The evening temperature is about 1 degree or 1 1/2 degrees higher than the morning record. In certain instances there may be a difference of 3 or even 4 degrees. The temperature falls by lysis, and is not considered normal until the evening record is at 98.2° F.

A fever with regular remissions is considered of favorable prognosis. A sudden drop in the temperature may mark the occurrence of hemorrhage or of perforation of the bowel.

Post-typhoid Elevations. *The Fever of Convalescence.*—Frequently, after the temperature has remained normal for several days there is a sudden rise (102° to 103° F.), and a drop at the end of 24 or 48 hours. It is generally dependent upon errors in diet, constipation, or excitement brought on by visits of friends. It may, however, inaugurate a relapse, or mark the onset of a complication. *The fever of relapse* partakes of the same nature as in the original attack, but is milder, and rarely continues longer than 10 days or 2 weeks.

The Skin.—The characteristic eruption of typhoid fever has been described. Sometimes there may be areas of erythema, confined to the abdomen or chest. Sudamina are very common, and result from profuse sweating. The facial expression is dull and listless, but differs from that of malarial fever, as the anemia is not so marked.

The pupils are usually dilated.

Respiratory Symptoms.—Respirations are somewhat hurried, and frequently bronchial râles are heard. There may be an early acute bronchitis.

Circulatory Symptoms.—Dicrotic pulse (in first week), of low tension; heart-sounds at first clear and loud, but later the first sound becomes feeble, and along the left sternal margin or at the apex a soft systolic murmur may be heard.

Gastric Symptoms.—Loss of appetite is an early symptom; rarely nausea and vomiting occur. The edges of the tongue may be reddened, while the center is coated.

Intestinal Symptoms.—Diarrhea is present in from 25 to 30 percent of the cases. It is a mistake to believe that it is an invariable symptom in typhoid. Abdominal tenderness and distention and gurgling in the right iliac fossa occur in a large proportion of cases. Diarrhea is most common toward the end of the first week, but it may not occur until the second or even the third week. The stools, which range from 3 to 10 within the 24 hours, are thin, offensive, granular, and resemble pea-soup. On standing they separate into a thin, serous layer, containing albumin and salts, and a lower stratum, consisting of epithelial debris, particles of undigested food, and triple phosphates. Blood-corpuscles may be found.

Nervous Symptoms.—Headache, slight deafness, and mental torpor may be present in the early stages; and later, in severe cases, profound stupor, muttering delirium, subsultus tendinum, and coma-vigil.

The blood presents no material changes until about the third week. At this time there is a reduction in the number of red corpuscles, which may fall as low as 1,300,000 to the cubic millimeter (Thayer), together with the hemoglobin, which is reduced in a greater relative proportion than the red cells. The absence of leukocytosis may aid in differentiating typhoid from septic and acute nflammatory processes.

The Urine.—Retention of urine is an early symptom in many cases. In the early stages, as in other febrile conditions, the quantity is reduced and of a higher color; later it becomes more abundant and possesses a lighter tint. Ehrlich has described a reaction that he believes is rarely met with except in typhoid fever. This so-called **diazo-reaction** is produced as follows: Two solutions are employed, kept in separate bottles, one containing a saturated solution of sulphanilic acid in a solution of hydrochloric acid (50 c.c. to 1000); the other a 0.5 percent solution of sodium nitrite. To make the test, a few cubic centimeters of urine are placed in a small test-tube with an equal quantity of a mixture of the solution of sulphanilic acid (40 c.c.) and the sodium nitrite (1 c.c.), the whole being thoroughly shaken. One cubic centimeter of ammonia is then allowed to flow carefully down the side of the tube, forming a colorless zone above the yellow urine, and at the junction of the two a deep brownish-red ring will be seen if the reaction is present. With normal urine a lighter ring is produced, without a shade of red. It is very important to bear in mind that countless millions of bacilli may be present in the urine, which should always be disinfected.

Convalescence ordinarily begins at the fourth week. In certain cases it may be protracted, and may be marked by falling of the hair, great enfeeblement of the system, and transitory mental derangement.

Varieties of Typhoid Fever. 1. **Mild and Abortive Forms.**—In the mild form the symptoms are similar in kind, but less intense, than in the graver attacks, although the onset may be sudden and severe. The spleen is enlarged, and rose spots are marked. Diarrhea may or may not be present. The duration is about 8 to 10 days.

In the abortive form the symptoms of onset may be marked, with shivering and fever of 103° F., or higher. The date of onset is definite. Rose spots may develop from the second to the fifth day. At the end of the first week or the beginning of the second week convalescence is established.

2. **The grave form** is usually characterized by high fever and pronounced symptoms affecting the nervous system, the gastrointestinal tract, and the renal or pulmonary organs.

3. **Latent or Ambulatory Form.**—In this variety the onset is very mild, and the patient does not feel ill enough to go to bed. It is marked by languor and perhaps slight diarrhea. In certain cases delirium may be present. Death is common from neglect of treatment.

4. **Hemorrhagic Form.**

5. **A febrile form** recognized by Liebermeister is very rare.

Typhoid Fever in Children.—Infants under the age of 2 years are rarely attacked; cases are not infrequent in children between the second and tenth years. Epistaxis rarely occurs; the rise in temperature is gradual; bronchial catarrh is often observed; nervous symptoms are prominent, and are manifested by wakefulness and delirium; diarrhea is often absent; the eruption is slight; the abdominal symptoms are mild; and perforation rarely occurs.

Typhoid Fever in the Aged.—After the age of 40 the disease is very rare.

Typhoid fever is rare in **pregnant women.** Abortion or premature delivery usually occurs in the second week of the disease. The mortality is high (17 percent).

Relapse is prone to occur. The true relapse sets in after complete defervescence of the fever and follows a somewhat milder course than the original type, and lasts from 2 to 3 weeks. Two, 3, or even 4 relapses may occur. The condition depends upon a reinfection, probably due to errors in diet, to constipation, or to overexertion of any kind.

Complications.—**Hemorrhage from the bowels,** a serious complication, occurs in from 3 to 5 percent of all cases, most commonly between the end of the second and the beginning of the fourth week—at the time the sloughs separate. The onset is often marked by a rapid fall in the temperature and by symptoms of collapse, both of which may occur some time before the blood makes its appearance in the stool. The mortality is from 30 to 50 percent of the cases.

Perforation occurs in from 5 to 6 percent of all cases, and is more frequent in men than in women. The peritonitis that it causes is marked by a sudden acute pain in the abdomen and by symptoms of collapse, followed by marked tenderness and rigidity of the abdominal walls, vomiting, a pinched expression of the face, dyspnea, and a small, rapid pulse. Great abdominal distention is usually present.

Peritonitis without perforation may occur by extension of the inflammation to the peritoneum surrounding the intestine.

Pneumonia.—Pneumonia and hypostatic congestion occur in about 8 percent of the cases.

Bed-sores are less frequently encountered than formerly, owing to the proper nursing now general.

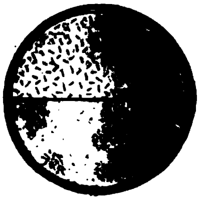
Thrombi in the veins occur in about 1 percent of the cases, and the left femoral vein is usually affected. Thrombosis is indicated by enlargement and edema of the limb affected.

Among other **complications** are excessive diarrhea, meteorism, gangrene, parotitis, pharyngitis, endocarditis, bronchitis, nephritis, and pyuria.

The Widal reaction is as follows:

Macroscopic.—The blood or serum to be tested is added either "to a young bouillon culture of the typhoid bacillus or to sterile bouillon, which is then at once inoculated with the bacillus. In the former case the reaction with typhoid serum appears usually within 2 or 3 hours, and consists in clarification of the previously turbid fluid and the formation of a clumpy sediment composed of accumulated bacilli. In the latter case the tube is placed in the incubator, and within 15 hours the reaction is manifested by growth of the bacilli in the form of a sediment at the bottom of the tube, the fluid remaining nearly or quite clear."

Microscopic Test.—The blood or serum is mixed with "a young bouillon culture or with a suspension in bouillon or salt solution of a fresh growth of the typhoid bacillus, and a drop or two of the mixture is examined at once under the microscope. With a dilution of 1:10 this microscopic typhoid reaction appears, as a rule, immediately or within a few minutes, and is evidenced by loss of motility and by clumping of the bacilli into masses of various sizes and shapes." When this reaction occurs, it is spoken of as a "positive reaction"; and when not present, it is said to be "negative."



TYPHOID AGGLUTINATION TEST.

Upper segment shows the freely moving germs. The lower the typical "clumping."—(*Greene.*)

The reaction is present in about 95 percent of cases.

Prognosis.—The mortality in private practice is from 5 to 12 percent, and in hospitals it is from 7 to 20 percent. Unfavorable symptoms are hemorrhage, delirium, meteorism, excessive diarrhea, and suppression of urine.

Prophylactic Treatment. Antityphoid Inoculation.—A. E. Wright has prepared a *vaccine* a, dead sterile culture of the typhoid bacillus, that has been used extensively in the British and United States armies; and that gives immunity for 2 to 3 years, while at the same time it is absolutely innocuous.

Two or three injections should be made at intervals of 10 days, the first of 500 millions, the second and third of 1000 millions each.

For the prevention of the resulting lessened coagulability of the blood Wright advises 30 to 40 grains of calcium chlorid, and alcohol should be forbidden. It has been found to diminish both the incidence and the mortality of typhoid fever. Leishman reports: "In 5473 soldiers vaccinated against the disease, 21 took it and 2 died; in 6610 soldiers practically under the same conditions, who were not vaccinated, there were 187 cases and 26 deaths; that is, among the vaccinated soldiers there were 3.8 cases per thousand, and among the unvaccinated 28.3 per thousand." It is recommended for troops, especially when concentrated in camps, for nurses and physicians, and all persons exposed in time of epidemic. Castellani advises for prophylaxis an inoculation of dead culture to be followed a week later by the inoculation of an attenuated live culture, maintaining that the degree of immunization obtained by the latter is greater, while at the same time the reaction is not severe and the person does not become a "carrier."

In the United States army over 8500 persons had been inoculated up to June, 1910, and none of them contracted typhoid, although among the unprotected in the same period of time there occurred more than 200 cases.

Under conditions of careful asepsis the injection is made subcutaneously into the arm at the insertion of the deltoid muscle, preferably at about 4 P. M., so that the greater part of the reaction may take place before morning. The reaction is in most cases very slight; severe general reactions occurring with headache, backache, vomiting, nausea, and is in every case entirely over in 48 hours. During this period it is best to abstain from active exercise.

The following procedures, suggested by Gilman Thompson, should be carried out in hospital practice, and, with modifications, in private houses:

1. The best disinfectants of typhoid urine and stools for practical use are: (*a*) 1:500 acidulated solution of corrosive sublimate; (*b*) a 1:10 crude carbolic acid solution; (*c*) chlorinated lime.
2. Owing to the possibility of injury to plumbing, the carbolic acid solution is preferable wherever plumbing is concerned. The lime is best for country use, in privies and trenches.
3. The disinfectant should be thoroughly mixed with the stool, and left in contact with it for fully 2 hours. Enough of the disinfectant must be added completely to cover the stool with the solution.
4. The bed-pan should be kept filled at all times with at least a pint of the disinfectant, into which the stool is at once discharged, and should be cleaned with scalding water and one of the disinfecting solutions.
5. Rectal thermometers, syringes, tubes, and all utensils coming in contact with any of the fecal matter must be disinfected with the corrosive sublimate or carbolic acid solution.

6. After each stool the patient's perineum and the adjacent parts should be washed and sponged with a 1:2000 corrosive sublimate solution.

7. Nurses and attendants should be cautioned to wash their hands thoroughly, and to immerse them in a 1:1000 corrosive sublimate solution after handling the bed-pan, thermometer, syringe, or patient, or after giving sponge or tub-baths.

8. All linen or bedclothing used by the patient should be soaked in 1:20 phenol solution, and subsequently boiled for fully 2 hours.

9. Disinfection of the stools should be begun as soon as the diagnosis of enteric fever is established, and should be continued for 10 days after the temperature has remained normal.

10. In localities where a proper drainage system is lacking, the stools should either be mixed with sawdust and cremated or buried in a trench 4 feet deep after being covered with chlorid of lime.

When epidemics are prevalent, the drinking-water and milk should be boiled.

Important for the patient and for the public is the removal of typhoid bacilli from the urine by the administration of urotropin in doses of 7 1/2 grains three times a day beginning the third week at least, and continued for several weeks during convalescence.

General Treatment.—The physician and attendants should ever keep in mind the fact that each individual case of typhoid fever is a focus for the spread of the disease. To carry out effective measures of prophylaxis is quite as much a part of the physician's duty as is the care of the patient.

General Management.—Careful nursing and a regulated diet are the essentials in a vast majority of cases. The patient should be kept in a well-ventilated room, *strictly confined to bed* from the onset, and remain there until the evening temperature has been normal for a period of at least 8 days. The constant use of the bed-pan should be strictly enjoined.

Diet.—A liquid diet should be begun at the onset, and should be continued throughout the course of the disease. Milk is the best food. If not well digested, a tablespoonful of lime-water may be added to each glass of milk, or it may be peptonized. The stools should be frequently examined, to see if they contain much fat. Other varieties of liquid foods may be given, such as strained soups, mutton or chicken broth, consomme, barley gruel, albumen water, and beef-juice. A pleasant fresh beef-extract may be made in the following manner: A thick piece of steak is seasoned with a small amount of butter, pepper, and salt, and subsequently placed on the top of a hot stove for a minute or two; it is then turned quickly to the opposite side, and allowed to remain until slightly browned; it is then cut into small pieces, to be masticated by the patient, only permitting the liquid portion to be swallowed. This diet may be allowed to patients in private practice when the persons are well known. In hospital practice it may prove dangerous, from the fact that solid particles might be swallowed surreptitiously. If diarrhea is present, soups, beef-juice, and beef-extracts may aggravate the condition, and milk, strained gruel, and barley-water should be substituted.

Plenty of cold water should be given to the patient. Fruits should not be given, but the juice of an orange or of a lemon may be taken at intervals.

Typhoid patients should be fed every 3 hours throughout the day. If there is great exhaustion, milk or liquid foods may also be given once or twice during the night, but in mild cases this is not necessary.

Hydrotherapy.—Since 1861 the value of bathing in fevers has been specially emphasized by the late Dr. Brand, of Stettin. Hydrotherapy may be carried out in several ways, of which, in typhoid fever, the most satisfactory are (1) by *sponging*, (2) the *wet pack*, and (3) the *full bath.*

Cold Sponging.—The water may be tepid, cold, or ice cold, according to the height of the fever. A thorough sponge bath should require a period of not less than 15 minutes. When from any cause a full bath cannot be given, sponging with ice-cold water may be used. It is specially valuable in the case of children and for delicate persons. At times it may be less objectionable to sponge one extremity at a time; then the abdomen and back, in regular order.

The cold pack is of special service in cases with pronounced nervous symptoms. The patient should be wrapped in a sheet wrung out of water at 60° or 65° F.; cold water is then sprinkled over the body with an ordinary watering-pot or a similar utensil.

The Bath (*Brand Method*).—The tub should be of such dimensions that the entire body except the head may be immersed. It seems best to give the bath every third hour when the temperature rises above 102.5° F. The temperature of the water at the beginning of the bath should be about 70° F., and it should be kept at this point by the addition of pieces of ice from time to time. The duration of the bath depends upon the height of the fever and upon individual susceptibility. In the majority of instances the duration varies from 15 to 20 minutes. When the colder (70° F.) bath is not borne well, it may be best to start with a higher temperature (80°–90° F.), and gradually to lower it by the addition of ice. After the first or second bath less objection is usually encountered.

The tub should be wheeled to the bedside, and after enveloping the body (in the case of women) in a sheet, two assistants gradually lower the patient into the water. As soon as the body (except the head) has been immersed, the head should be sponged, and afterward should be kept cool. From the moment the patient is placed in the water, and in order to prevent chilling, shivering, and cyanosis, and to stimulate the circulation, the extremities and trunk should be constantly rubbed, paying especial attention to the feet and hands, which first feel the effects of cold. The abdomen may be rubbed only lightly or not at all. After removal from the bath the patient should be wrapped in blankets, and, if necessary, hot-water bottles or bags containing hot water may be applied to the extremities.

In private practice a substitute for the tub may be devised as follows: Place a quilt or blanket on a cot, cover with a piece of thick black oilcloth, and over this place a sheet; upon the latter the patient may be placed, and the bath may then be conducted as described. It will be of great advantage to elevate the end of the cot upon which the head rests, in order to assist drainage into a receptacle placed at the foot.

Contraindications to the bath are peritonitis and hemorrhage. Pregnancy, bronchitis, and pneumonia are not contraindications.

Advantages of the Bath.—(1) The fever is reduced; (2) the intellect becomes clearer, stupor is lessened, and the muscular twitchings disappear; (3) there is a general tonic action on the nervous system, and particularly on the heart; (4) insomnia is lessened, the patient usually falling asleep for several hours after the bath; and (5), most important of all, the mortality is much reduced. Under the expectant and general medicinal plans of treatment the mortality ranges from 12 to 17 percent; with the Brand method the mortality in many instances has been reduced to a fraction above 7 percent.

Medicinal Treatment.—It should be constantly remembered that in the treatment of typhoid fever overdrugging does harm. In many cases all that may be required is a mild purge at the onset, and subsequently a mild diuretic, continued for a day or two. The daily use of medicinal antipyretics is to be deprecated, from the fact that they are depressing, especially to the heart. In obstinate cases, when it seems impossible to control the temperature by baths, and when they are demanded too frequently, a single dose (5 grains) of phenacetin or antipyrin or pyramidon may be administered.

Antiseptic Medication.—Remedies that have been recommended are acetozone, beta-naphthol, naphthalin, salol, guaiacol, carbolic acid, corrosive sublimate, iodin, and calomel. Irrigation of the colon has been advised.

Antitoxin Treatment.—Antityphoid serum has been tried by several observers, but the effect has been slight.

Vaccine Therapy.—Recent reports of the use of vaccine, preferably autogenous, are very encouraging, most cases having been decidedly benefited. Irwin and Houston report the cure of a typhoid "carrier" by the injections, sodium lactate being also given to make the urine alkaline. At the end of the treatment no bacilli were found in urine or feces.

Treatment of Special Symptoms.—**The abdominal pain and tympanites** are best treated with fomentations or with turpentine stupes. A flannel roller is placed beneath the patient, and then a double layer of thin flannel, wrung out of very hot water, with a dram of turpentine mixed with the water, is applied to the abdomen and covered with the ends of the roller.

Meteorism.—Turpentine internally has been highly recommended by the late Dr. George B. Wood. It may be given in the form of an emulsion, as follows:

℞.	Turpentine, Compound tincture of lavender, Sugar,	each, ʒ jss
	Acacia,	ʒ ij
	Water, enough to make	℥ iij.

Two teaspoonfuls every 3 or 4 hours.

℞.	Beta-naphthol,	ʒ ss
	Bismuth subnitrate,	ʒ j.

Divide into 6 powders. One powder every 3 or 4 hours.

℞.	Naphthalin,	ʒ j
	Bismuth subnitrate,	ʒ ss
	Willow charcoal,	ʒ j.

Divide into 6 powders. One powder every 3 or 4 hours.

℞.	Menthol,	gr. iij
	Bismuth subnitrate,	gr. xl

Divide into 6 capsules. One every 3 or 4 hours.

The following may also be tried:

℞.	Guaiacol, Salol,	each, gr. v
	Beechwood creosote,	♏ v.

In some cases soups, beef-extracts, and similar foods give rise to the disturbance, and peptonized milk should be substituted. The rectal tube may give relief; also injection of milk of asafetida (5 to 6 ounces).

Diarrhea.—In this condition no medicines should be given unless the stools number 3 or 4 daily. As in the case of meteorism, it sometimes ensues from animal foods, for which albumin water, barley-water, strained gruel, and the like, should be substituted. Boiling the milk is frequently all that may be necessary. In some cases lime-water added to milk will do good.

℞.	Bismuth subnitrate,	ʒ ijss
	Paregoric, Compound tincture of lavender,	each, ℥ j
	Elixir of curacoa,	ʒ iij
	Water, enough to make	℥ iij.

Two teaspoonfuls every 3 or 4 hours.

℞.	Codein sulphate,	gr. iij
	Bismuth subnitrate,	ʒ j.

Divide into 6 capsules. One every 3 hours.

℞.	Dover's powder,	ʒ ss
	Bismuth subcarbonate,	ʒ j.

Divide into 6 powders. One every 3 hours.

℞.	Codein sulphate,	gr. iij
	Naphthalin, Bismuth subnitrate,	each, ʒ ss
	Aromatic powder,	gr. x
	Sugar,	ʒ ss.

Divide into 6 powders. One every 3 hours.

Constipation should be relieved every 2 days by enemata of water containing a small amount of soapsuds.

Hemorrhage.—Elevate the foot of the bed; allow the stools to be passed into the draw-sheet; apply an ice-bag or ice-coil to the abdomen; and give a hypodermic injection of morphin (1/4 grain), though it has the disadvantage of masking the symptoms. Administer internally opium (1 grain) every 3 hours, or the lead and opium pill. The diet should be very bland, consisting of peptonized milk, or malted milk.

Peritonitis without perforation may have a favorable outcome if absolute rest be insisted upon. Morphin (1/4 grain hypodermically) should be given, and repeated if necessary.

Perforation and peritonitis, as a rule, end fatally. Laparotomy should be done as soon as the diagnosis is positive; of about 120 cases collected by Finney, 20 percent recovered.

Heart-failure.—When the pulse grows successively weaker, whisky (3 ounces) should be allowed every 3 hours, day and night, if necessary.

℞.	Aromatic spirit of ammonia,	ʒ iv
	Tincture of digitalis,	ʒ ij
	Elixir curacoa,	ʒ iij
	Water, enough to make	℥ iij.

Two teaspoonfuls in water every 3 hours.

Strychnin (1/40 grain) or ether (30 minims) may be given hypodermically. From 1/2 to 1 liter of salt solution may be infused beneath the skin 3 or 4 times a day. Collapse may be treated by camphor (1 grain) in olive oil, (15 minims) given hypodermically.

Nervous symptoms are best treated by hydrotherapy. In the cases that show meningeal symptoms the cold pack should be used. An ice-cap may be applied to the forehead and one to the back of the neck. Blisters are of doubtful benefit, and add to the distress. For insomnia sulphonal (15 grains) or chloralamid (30 grains) or trional (10 to 15 grains) may answer. As a last resort give chloral or morphin (1/4 grain) hypodermically twice daily.

℞.	Strontium bromid, Sodium bromid,	each, ʒ vj
	Peppermint water, enough to make	℥ iij.

A tablespoonful every 3 hours.

℞.	Extract of opium,	gr. iij
	Asafetida,	ʒ ss
	Extract of henbane,	gr. iij.

Add enough cacao-butter to make 6 suppositories. One to be used every 4 hours.

℞.	Chloral,	gr. xv
	Strontium bromid,	ʒ jss
	Water,	℥ vj.

Use as enema with a long rectal tube, inserted about 18 inches.

Diuretic solutions:

℞.	Sweet spirit of niter,	℥ ss
	Solution of potassium citrate,	℥ ijss
	Elixir curacoa,	ʒ iij
	Water, enough to make	℥ iv.

A tablespoonful every 3 hours. Large quantities of water may be given immediately after each dose of medicine.

Also—

℞.	Potassium acetate, Tincture of digitalis,	each, ʒ jss
	Elixir curacoa,	ʒ ijss
	Water, enough to make	℥ iv.

A tablespoonful every 3 or 4 hours.

Suppression and Retention of Urine.—Suppression of urine is a rare complication. Retention, however, frequently occurs, and may be relieved with a sterilized catheter 2 or 3 times daily.

Bed-sores.—Prevent bed-sores by hydrotherapy and by sponging the back frequently with diluted alcohol. Should they form, treat them antiseptically.

Sore Mouth.—Cleanliness of the mouth in the treatment of typhoid fever becomes of the greatest importance. One of the chiefest aims should be to keep the appetite and digestion in the best condition possible. Remedies given for other conditions arising during the course of the fever are seldom received with more gratefulness than those used for this purpose. If the teeth, tongue, and gums of the patient are sponged daily with a very weak (0.5 percent) carbolized glycerin solution, many cases of diarrhea and tympanites will be prevented. Sordes accumulate upon the teeth, the appetite is lost, the lips become parched, the thirst is unquenchable, and a condition of much discomfort supervenes when cleanliness is neglected. It should be remembered that in this disease mouth-breathing is common, causing the tongue to become dry and brownish; and, if it is neglected, it may become fissured.

℞.	Phenol,	gr. v
	Glycerin,	ʒ iij
	Peppermint water,	℥ j
	Water, enough to make	℥ iv.

To be used with tooth-brush at least once daily.

TYPHUS FEVER.—An acute, infectious, and epidemic fever, highly contagious, and characterized by sudden invasion, profound depression of the vital powers, sickening odor, and a peculiar maculated and petechial eruption, favorable cases terminating by crisis about the fourteenth day. There is no constant lesion.

Etiology.—It is due to a special infecting germ, the character of which is unknown, but which is influenced by filth and overcrowding. It is rarely seen in the United States except in seaports. The period of incubation is about 12 days.

Symptoms.—It begins abruptly with a chill, followed by violent fever, the temperature within a few days reaching 104° to 105° F. There is a frequent, bounding pulse, soon becoming small, weak, and rapid. The cardiac impulse and first sound are almost effaced, there is severe headache, followed by violent delirium. From the fifth to the seventh day a coarse, red, diffused, measly eruption, with a mottling of the skin, develops all over the body except the face, not disappearing on pressure. The face is apathetic and has a uniform deep, dusky flush, the skin has a glased appearance, the pupils are contracted, and the conjunctiva is red and congested. With the development of the disease there is cutaneous hyperesthesia, muscular soreness, and tenderness over the tibia. There are great prostration and muscular feebleness, vertigo, tremor, and subsultus. Constipation is the rule. At the end of the second week the temperature suddenly declines and the patient passes into a rapid convalescence.

Complications.—Pneumonia and swollen parotid glands are common.

Diagnosis.—It is differentiated from **typhoid fever** by the age, season of the year, onset of the disease, character of the eruption, intestinal symptoms, and the Widal reaction. The following is a comparative table, showing the main points in differential diagnosis.

Typhus Fever.	Typhoid Fever.
Attacks quickly; incubation 9 days.	Commences slowly; incubation about 13 days.
Occurs at any age.	Most common in youth and childhood; rarely occurs after 40.
Rare among the higher classes, except those exposed.	As common among the rich as among the poor.
Mulberry eruption on fourth or fifth day, on extremities, lasts until close.	Rose eruption on seventh to tenth day; isolated, flattened papules (few) on abdomen and back, in successive crops, which fade and disappear.
Brain chiefly affected; bowels often but little so; abdomen natural; evacuations dark, but never bloody (these are ocasionally reversed).	Bowels chiefly affected; evacuations ocher color and watery; sometimes hemorrhage or even ulceration; abdomen tumid.
Contracted pupils; dusky face.	Dilated pupils; cheeks flushed.
Pulse increases to 120, and temperature rises to 105°F., until third day; high for 6 days, then fall.	Pulse and temperature rise and fall independently, and without uniformity, but both are usually high to fifteenth day.
Lasts from 2 to 3 weeks.	Lasts from 4 to 6 weeks or longer.
Relapses rare.	Relapses frequent.
Death from coma or from congestion of the lungs in first or second week.	Death from asthenia, pneumonia, hemorrhage, or perforation of intestine, in or after third week.
Arises from destitution, overcrowding, bad ventilation; is highly contagious and generally epidemic; no microbe determined.	From poisoned drinking-water, putrid animal matter, bad drainage; is not contagious, often sporadic; Eberth's bacillus present in the intestinal lesions, and in the spleen, liver, blood, etc.
Postmortem: changes not constant; the most frequent are dark blood, enlarged spleen, soft heart.	Postmortem: morbid Peyer's patches; enlarged mesenteric glands; ulcerated mucous coat of intestines; enlarged and soft spleen; ulcerated pharynx.
	Responds to the Widal reaction.

Measles begins milder, with coryza and cough, and never shows such pronounced nervous phenomena; but an early eruption occurs, appearing on the face.

Cerebrospinal fever has many symptoms in common, and but for the rarity of typhus in this country would be more confusing. The headache and rigidity of the muscles of the neck are much more pronounced in cerebrospinal fever and the prostration is less than in typhus fever. The eruption of typhus is characteristic, and should prevent error. Specific microorganisms are found in cerebrospinal fever.

In the early stages small-pox and bubonic plague have been mistaken for typhus fever.

Prognosis.—The unfavorable indications are high temperature, frequent pulse, early stupor, presentiment of death. The favorable indications are youth, moderate temperature and pulse, and mild nervous phenomena.

The duration is about two weeks. The mortality varies from 10 to 30 percent.

Treatment is symptomatic. As typhus fever is distinctly contagious, isolation is imperative, with immediate removal and disinfection of the patient's excreta. All cases are benefited by small doses of the mineral acids, alternating with quinin sulphate. For high temperature, cold sponging, cold pack, or full doses of quinin, antipyrin, acetanilid, or acetphenetidin, or the systematic use of the cold bath, or "tubbing," as now used in typhoid fever.

For the headache and delirium, cold to the head is indicated. In the young and strong a few leeches to the temple, and chloral, with or without the bromids, may be used. For constipation mild laxatives are given. For the debility give alcohol early and in full doses, and spirit of chloroform in dram doses whenever there is danger of collapse. During convalescence such tonics as quinin and strychnin may be given. The patient may be nourished by by nutritious liquids, such as milk, broths, egg-nog, etc.

TYROTOXICON.—A ptomain obtained by Vaughan from poisonous cheese, poisonous milk, poisonous ice-cream, etc. Chemically, it is very unstable; it may disappear altogether in 24 hours from milk rich with the poison. It induces vertigo, nausea, vomiting, chills, rigors, severe pains in the epigastric region, dilatation of the pupils, griping and purging, a sensation of numbness, or "pins and needles," especially in the limbs, and marked prostration or death. The symptoms may vary somewhat in different individuals. The poison is thought to be the cause of the summer diarrhea of infants.

Treatment of Poisoning.—It is best to give emetics if vomiting is not free, or to employ the stomach-pump or siphon to wash out the stomach, and to administer thymol in alcoholic solution, or salol, napthalin, or other antiseptics. The antagonists are opium and other sedatives. Stimulation is necessary when there is prostration. See PTOMAIN-POISONING.

U

ULCERS.—An ulcer is the term applied to an open sore produced by a loss of substance of the free surface of the skin or mucous membrane in the process of ulceration, or of ulceration and gangrene combined. The term, moreover, is sometimes extended to any open granulating wound the result of an injury or operation.

Varieties.—The various names given to ulcers are derived either from their local conditions and surroundings or from their specific cause. The characters of the specific ulcers, however, often become obscured by accidental local conditions; and these latter, again, are constantly changing from day to day, so that an ulcer which at one time would be called callous, may at another time be in a sloughing state. The following are examples of the chief types of ulcers, but in practice many minor shades of difference in the local appearances occur, so that it may be difficult or impossible to assign a given ulcer to a particular type.

The Simple, Healthy, or Healing Ulcer.—The edges are smooth and shelving, and extend in the form of a bluish-white film over the marginal granulations. The base is level, or nearly so, and is covered with healthy granulations. The discharge is inodorous pus, or if the ulcer is dressed antisepically, and all irritation avoided, merely healthy serum. The surrounding skin is healthy. This is the type that all ulcers assume when healing.

Treatment.—Rest and protection by any light unirritating dressing are all that is usually required. When large, cicatrization may be promoted by skin-grafting. Two methods are employed. See PLASTIC SURGERY.

The exuberant or fungous ulcer is generally due to obstructed venous return from the granulations, the result of undue contraction of surrounding tissues, as seen for example, after a burn. The edges are healthy, but the granulations rise above the surface, and are turgid, dark red, redundant, and bleed readily. The discharge is purulent.

Treatment.—Solid nitrate of silver or sulphate of copper should be rubbed over the granulations until they are reduced to healthy proportions.

The edematous or weak ulcer generally occurs in connection with tubercular bones or joints, but any ulcer may become edematous if healing is delayed by the prolonged use of emollient applications. The edges and adjacent tissues are generally healthy; and the granulations are upraised, flabby, bulbous, semitranslucent, watery, and friable. The discharge is profuse and watery.

Treatment.—Removal of the cause, when possible, uniform pressure, and applications of lotions of nitrate of silver or similar astringents.

The Inflammatory and Inflamed Ulcers.—These terms are applied to ulcers in which the inflammatory phenomena are the most marked features. The inflammation may depend on some constitutional disturbance consequent upon alcoholism, improper food, and the like; or it may be the result of local irritation applied to any ulcer, whatever its previous character. For the purpose of distinction, the term "inflammatory" is applied to the former condition, while the term "inflamed" is generally restricted to ulcers of the latter class. Inflammatory ulcers are usually of irregular shape: the edges are ragged and shreddy, or abrupt or sharp-cut; the surrounding skin is red and edematous, and the base void of granulations, dry, livid red, or covered with a serous or sanious discharge mixed with tissue debris, and, if the inflammation is very acute, with yellow sloughs. When inflammation attacks a previously granulating ulcer, the granulations become florid and swollen, and generally slough, while the surrounding parts present the ordinary inflammatory phenomena.

The treatment should consist of rest, elevation of the part, removal of all local irritation, application of warm antiseptic lotions (as boric acid) on lint, attention to the constitutional state, and regulation of the secretions.

The Sloughing Ulcer.—This is merely a severer degree of the former, and it differs from it in that the inflammatory process is more intense and of a spreading character. It seldom occurs except in connection with venereal disease. The microorganisms at work in this and in the phagedenic form of ulcer are probably only the ordinary pyogenic micrococci found in all ulcers, but here acting with greater intensity in a vitiated constitution. The ulcer spreads with great rapidity, the edges are undermined, inverted, and dusky red, and the base is covered by an ash-gray or black slough. There are, commonly, much pain and severe constitutional fever.

The treatment is similar to that of the inflamed variety. Antiseptics should be freely used if the ulcer is foul, and opium should be given if there is much pain. When due to syphilis, the proper remedies for that affection should, of course, be given; but mercury should be used cautiously or should be altogether withheld until the sloughing has ceased.

The phagedenic ulcer, owing to improved sanitation and hygiene, and to the more scientific treatment of wounds, is seldom seen at the present day except in connection with venereal disease in persons whose constitution is thoroughly broken down by intemperance, defective nutrition, and general neglect. The edges of the ulcer are irregular, swollen, and undermined, and the surrounding skin is of a dark, purplish, and dusky red color. The surface is devoid of granulations, and is covered with a dark, blood-stained, ichorous discharge, often mixed with sloughs. When the sloughing proceeds to any extent, the ulceration is spoken of as **sloughing phagedena.** The ulcer spreads with fearful rapidity, and often destroys the whole organ, as the penis or vulva, and is attended with severe constitutional disturbance.

Treatment.—The patient should be placed under an anesthetic, the surface of the ulcer dried, and then thoroughly destroyed with fuming nitric acid. Some surgeons apply carbolic acid (1:20) or perchlorid of mercury (1:1000), and then dust with iodoform. Application of pure bromin is very effective. The continuous use of the hot bath is often of much service in phagedena of the penis and vulva. Internally, opium should be given in full doses, with tonics, nourishing diet, and, when indicated, stimulants. Thorough ventilation and good hygiene generally are imperative.

The Chronic, Callous, or Indolent Ulcer.—This condition of an ulcer is the result of continued irritation and neglect, in consequence of which the edges become infiltrated with inflammatory material, which impedes the circulation and prevents healing. It is very common in the lower third of the leg in the poorer classes. The edges are smooth, white, callous, rounded, steep, and quite insensitive when touched. The adjacent skin is generally congested or eczematous. The base is covered with a thin, sanious discharge, while there are either no granulations, or those present are small, flabby, pale, and ill formed. These ulcers often exist for years, and are usually attended with but little pain, and though they are at times small, at other times they extend nearly round the leg. They are often adherent to the fascia, periosteum, or bone. Old, callous ulcers, when subjected to continued irritation, are apt, as age advances, to become epitheliomatous.

Treatment.—The callous edges should first be softened by emollient dressings, and uniform pressure subsequently applied by a Martin's bandage or by strapping and a bandage. The strapping plaster, cut into strips 1 1/2 inches wide, should be evenly applied and should extend 2 inches below and the same distance above the ulcer. Holes should be cut in the strapping opposite the ulcer to allow of the escape of the discharge. Over the strapping a bandage from the foot to the knee should be applied. The bandage should be changed daily; the strapping once or twice a week. Iodoform or some other antiseptic powder should be sprinkled on the ulcer beneath the strapping. Other applications which have been found useful are Unna's paste, spirit of camphor, tincture of iodin and a weak solution of sulphate of copper, two or three grains to the ounce.

Cases intractable to other treatment have been much benefited and sometimes cured by baking in the hot air oven for thirty minutes daily.

When these ulcers are adherent to the fascia or periosteum their base should be liberated either by multiple radiating incisions or by a circular incision about a half an inch from their edge. When the ulcer is very large or extends quite round the leg or shows signs of becoming epitheliomatous, amputation is indicated.

The Varicose and Eczematous Ulcer.—These terms are applied to any ulcer, whatever its other characters, when associated respectively with a varicose state of the veins or an eczematous condition of the skin. Both conditions frequently occur together.

The Irritable or Painful Ulcer.—Though any ulcer may be irritable or painful, these terms are generally restricted to a small, painful ulcer around the anus, and to a small, superficial, generally congested ulcer, commonly situated near the ankle, and occurring chiefly in women beyond middle life. The pain is often intense, and is generally believed to depend upon the involvement of the nerve-endings.

Treatment.—The improvement of the general health, small doses of opium, and cauterization with nitrate of silver, will often suffice to cure the ulcer. In inveterate cases an attempt may be made to divide the nerves subcutaneously, after the manner of Hilton.

Tuberculous or strumous ulcers are generally due to the breaking down of enlarged tuberculous lymphatic glands, the bursting of subcutaneous tuberculous abscesses, or the ulceration of the so-called tuberculous or strumous nodules. They are generally multiple, and often confluent, forming an irregular indolent sore. The edges are pale, bluish-pink, thin, and undermined. The granulations are pale, edematous, protruding, and bleed readily on handling. The discharge is thin, yellowish-green, and scanty. Enlarged glands and cicatrices of former ulcers are frequently present in their vicinity. The cicatrices are generally raised, pale pink or white, while the skin is often puckered around them.

Treatment, constitutionally, is that for struma and tubercle. Locally, the sore should be destroyed by paring away the edges and scraping the base with a Volkmann's spoon. The cicatrices may sometimes be dispersed by repeated blisterings or by subcutaneous division.

Syphilitic Ulcers.—Primary ulcers or chancres are described under SYPHILIS (*q. v.*). Those occurring in the course of constitutional syphilis may be divided into the superficial and deep, and are treated locally as well as constitutionally.

ULNA.—See FOREARM.

UMBILICAL CORD (Funis).—A vascular, cord-like structure connecting the fetus with the placenta.

Origin.—It is derived from the pedicle of the allantois, appearing about the third week of gestation. When fully formed, it is composed of two arteries, one vein, the omphalic duct, the remains of the umbilical vesicle, and the pedicle of the allantois, surrounded by a covering of mucous tissue (Wharton's jelly), and insheathed by a layer of amnion. At term the cord is from 50 to 60 cm. in length, and from 1 to 2 cm. in thickness.

Function.—It is the medium of communication between the mother and child. It supplies the fetus with rich arterial blood, and returns to the mother impure venous blood.

Abnormalities. Length.—The cord may be very much longer (250 cm.) or very much shorter (1 cm.) than normal. If too long, it is likely to be coiled about the fetus or is liable to prolapse; if too short, it may prevent descent of the fetus, causing great pain at the placental site and, finally, premature detachment of the placenta.

Thickness.—Sometimes there may be an excess of mucous tissue, causing great increase in the thickness of the cord. This does not usually involve its entire length.

Torsion.—From 8 to 12 twists in the cord are normal; they are caused by the twisting of the arteries around the vein. Extreme torsion may sometimes occur, rarely causing interference with the blood supply to the fetus.

Coils and Knots.—True knots have been found in the cord, although they are not usually tight enough to interfere with the circulation. The cord is frequently found coiled around the child's body. In about 25 percent of cases it is coiled around the neck.

Insertion.—The cord is usually inserted into the central part of the placenta, occasionally into the periphery (battledore placenta). When the vessels run between the amnion and chorion before entering the placenta, it is said to be a velamentous insertion.

Cysts, Tumors, and Calcareous Deposits.—These conditions are occasionally found in the cord, but they are, as a rule, of no significance.

Care after Labor.—After the pulsations in the cord cease it should be ligated, a piece of narrow iodoform tape or aseptic silk being used for this purpose. Only one ligature should be used, placed about 1 1/2 inches from the child's abdomen. It should first be secured by an ordinary surgeon's knot and then by a bow-knot, the ends being left long, so that it may be tightened after the child has had its bath. The cord should now be cut about 1/2 of an inch beyond the ligature, care being taken that no part of the child is injured by the scissors. The free end of the cord is allowed to drain into a vessel, thus decreasing the size of the placenta, facilitating its separation from the uterus, and hastening its expulsion. After the child has received its bath, the ligature around the cord should be tightened, and the cord dusted with a powder composed of salicylic acid and powdered starch, 1 part to 4 respectively. It should now be inclosed in a piece of salicylated cotton and the binder applied. The cord usually drops off about the fourth day; the granulating ulcer remaining gradually heals and retracts, forming the umbilicus.

Septic Infection.—This is a rare condition if proper asepsis is observed in ligating and dressing the cord. When present, the cord is inflamed and thickened, and a grayish, diphtheritic membrane may cover its distal end. High fever is a usual accompaniment.

The treatment consists of applications of a strong solution of mercuric chlorid (1 : 500) and in proper dressing, as described.

Umbilical Fungus.—An overgrowth of granulations may occur about the umbilical ulcer or the cord may remain as a projection of well-organized connective tissue. In the former case the granulations should be cauterized with nitrate of silver; in the latter the cord should be religated close to the abdominal wall and the excess removed with scissors.

Hemorrhage (Omphalorrhagia).—This may be primary, from imperfect ligation of the cord, or secondary, occurring after the cord has fallen.

The mortality is very high, being probably 75 percent or more.

Treatment.—In primary hemorrhage the cord must be religated; occurring from the umbilical ulcer, after the cord has fallen, the bleeding point, if seen, should be ligated, or pressure and astrigents may be tried. If these fail, a fold of the abdominal wall should be transfixed with a harelip pin passing below the umbilicus, the pin passing beneath the hypogastric arteries; over this a figure-of-eight ligature should be applied. Occasionally, it may be necessary to pass a second pin above the umbilicus, so as to occlude the umbilical vein.

Prolapse.—The descent of a loop of cord in advance of the presenting part of the fetus. This is not a very rare complication, occurring once in about 250 labors.

Causes.—The principal causes are: (1) Lack of conformity between the presenting part of the child and the maternal pelvis, as in deformed pelves, small head, and abnormal positions; (2) hydramnios; (3) excessive length of cord; (4) placenta prævia.

Prognosis.—The fetal mortality is high, over 50 percent of children losing their lives from asphyxia.

The treatment consists of prompt replacement of the cord, if possible. This may be accomplished by the fingers alone or by the aid of some instrument, such as a catheter and string. A piece of string about 4 inches long is passed through the eyelet of the catheter, and the ends are tied; the cord is placed in the angle made by the loop and catheter, and the free end of the loop is hooked over the top of the catheter. In this way the cord is held fast, and may be carried back into the uterus. When the catheter is withdrawn, the loop passes over the end and the cord is released. If the patient is placed in the knee-chest posture, reduction will be very much facilitated.

After reduction has been accomplished, the patient should be kept in the knee-chest posture, or, at least, should have the buttocks elevated, so that the prolapse may not recur. This precaution is unnecessary after the presenting part has descended to the pelvic floor.

If it is found impossible to reduce the cord, it should be placed in a position in which it will be least liable to suffer severe compression—usually over the left sacroiliac joint—and rapid delivery of the child should be effected, either with forceps or by version.

UNCINARIASIS.—See Ankylostoma, Hookworm Disease.

UNCONSCIOUSNESS.—See Coma.

UNGUENTUM.—See Ointment.

URANOPLASTY.—See Cleft Palate.

URATES.—Combinations of uric or lithic acid with a base. See Urine (Examination).

UREA.—$CO(NH_2)_2$. The chief solid constituent of urine and the principal nitrogenous end-product of tissue metamorphosis. See Urine (Examination).

UREA-QUININ.—See Quinin and Urea Hydrochlorid.

UREMIA.—The name given to a certain group of symptoms resulting from nephritis, and due to the circulation in the system of the effete products that should be eliminated by the kidneys.

Etiology.—The exciting agent is unknown. Certain facts, however, lead to the belief that there is an accumulation in the system of organic basic products—ptomains and leukomains—which may cause uremia.

Symptoms and Clinical Course.—These are mainly referable to the nervous system. In acute uremia the symptoms may appear without any previous warning. In the more chronic form there are such premonitory symptoms as headache, vertigo, morning nausea, indistinct vision, drowsiness, cool skin, obstinate constipation, various cutaneous eruptions, and a diminution in the amount of the urine, which usually contains albumin and casts.

The uremic attack may manifest itself in a variety of ways:

Gastrointestinal Variety.—The patient suddenly experiences attacks of vertigo, pallor of face, nausea and vomiting, with fever, the temperature varying between 100° and 103° F., pulse tense and rapid, respiration hurried, and the urine scanty, with low specific gravity; unless the symptoms are promptly relieved, convulsions may occur, followed by coma and death, or drowsiness may supervene, followed by coma, which is really nothing but a profound sleep. Rarely, an acute maniacal outbreak follows the gastrointestinal symptoms.

Convulsive Variety.—Without any appreciable prodromes there are epileptiform convulsions, with or without loss of consciousness. The convulsions may consist of a single paroxysm, or a succession of fits may follow one another at intervals of a few minutes or of several hours, the patient being in a condition of more or less profound insensibility during the intervals. The fits almost exactly simulate true epilepsy. In this variety the temperature is high—from 103° to 106° F., or more; the pulse is rapid, with or without tension; the respirations are quickened. Coma, followed by death, is a very common ending of this variety of uremia, or after a profound sleep of hours the patient gradually recovers his usual health. Alcoholic excesses are responsible for many of these attacks.

Cerebral Variety, or Uremic Coma.—This form develops either gradually, with an increasing drowsiness, associated with headache and irritability of temper (mild mania), nausea, vomiting, and rise of temperature, often reaching 105° F., rarely 107° F., with rapid, full pulse; or the patient may fall suddenly into a condition of profound coma, the symptoms closely resembling an apoplectic stroke, except the high temperature. Uremic coma is always accompanied by rise of temperature and stertor. This stertor is peculiar; it is not the "snoring" of apoplexy, but a sharp, hissing sound produced by the rush of expired air against the teeth or hard palate. The respirations are acclerated and the pulse is rapid, but of low tension. This variety may suddenly terminate fatally with a convulsion, or a deepening coma with prostration and cold, wet skin, with edema of the lungs. Rarely, there may be gradual recovery.

Pulmonary manifestations are nocturnal dyspnea, usually of a paroxysmal character. Cheyne-Stokes breathing may continue for several weeks, and is not a necessarily fatal symptom.

Abdominal manifestations are obstinate vomiting and profuse diarrhea.

General Manifestations.—The skin is dry and has a dusky hue; the breath has a urinous odor; the urine is scanty, albuminous, contains different varieties of casts, and is deficient in urea. The temperature is normal or slightly subnormal, and the pulse is slow and full, until late in its course, when it becomes rapid and feeble.

Differential Diagnosis.—The clinical history and examination of the urine will aid in determining the diagnosis. See Coma, Convulsions.

Prognosis is unfavorable.

Treatment.—The first indication is to aid the disabled kidneys in eliminating the waste products of the body by stimulating the skin and bowels to activity. Croton oil (1 or 2 drops) with olive oil (1 dram) should be given at once, to produce rapid catharsis. Elaterium (1/8 grain) may be given every 3 or 4 hours until 2 or 3 doses have been taken. Calomel (2 grains) with compound jalap powder (20 grains) every hour until 4 doses have been taken.

A hot bath (110° F.) or a hot vapor bath should be given from the onset of the symptoms to produce free diaphoresis.

The patient may be wrapped in blankets wrung out in hot water and given hot drinks to increase perspiration. If the pulse is full and bounding, venesection may be performed. Chloral (1 dram) may be given by the rectum to control the convulsions. Inhalations of chloroform or nitrite of amyl may also be used.

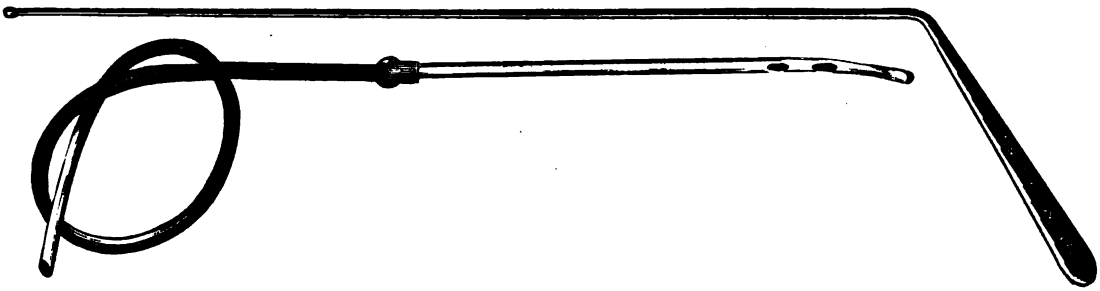
If the pulse is feeble, the following may be used:

℞. Tincture of digitalis, ʒ ij
Aromatic spirit of ammonia, ʒ v
Aromatic elixir, ʒ iv
Water, enough to make ℥ iij.

Two tablespoonfuls every 3 or 4 hours.

If collapse threatens, give strychnin (1/30 grain), atropin (1/100 grain), or nitroglycerin (1/100 grain) hypodermically. The diet should be composed of liquids. See Eclampsia.

URETERS, CATHETERIZATION.—This method constitutes a real advance in the accurate diagnosis of certain morbid renal conditions. By introducing a catheter directly into the ureter it can be learned whether blood or pus which is contained in the urine comes from the kidneys, and if so whether it is derived from one or both of these organs. The patency of the ureter can also be determined, and by injecting fluid through the catheter it can be learned whether the pelvis of the kidney is dilated. Suppurative conditions of the renal pelvis may be treated directly by the injection of medicated solutions. The secretory power of the two kidneys can also be determined when this method is employed in connection with certain functional tests. Casper and Richter found that in health the urine secreted simultaneously by the two kidneys contained about the same quantity of nitrogen, urea, and salts and that the freezing-point of both fluids was the same. In disease, however, these relations are altered, the diseased kidney excreting less than the healthy one. The same holds true of the excretion of phloridzin, which produces an artificial diabetes of short duration. Thus it is seen that the possibility of securing urine from each kidney separately by means of the ureteral catheter enables the clinician to obtain valuable diagnostic data concerning the functional capacity of each organ. At present it may be considered an invariable rule in renal surgery to have an examination of the urine obtained separately from each kidney made upon one or more occasions before resorting to operation. If the functional capacity of both kidneys is low, the removal of one might be followed by uremia and death.



Kelly's Searcher, above, for Investigating a Doubtful Ureteral Orifice.
Short Ureteral Catheter, Below, with Rubber Tubing Attached.

Catheterizing cystoscopes are made both in the direct and indirect varieties. The instruments of Nitze, Casper, Albarran, Bransford Lewis, Brown, and Buerger are most commonly used. They all carry two catheters, which permit simultaneous catheterization of both ureters.

In the female the ureters may be catheterized by the aid of a speculum passed through a dilated urethra, the patient being in the lithotomy position with the pelvis well raised, or in the genu-pectoral position. The modern perfected cystoscopes, however, render such a procedure unnecessary, and moreover, afford an easier method for the average operator.

The technic of ureteral catheterization is the same as that of cystoscopy. The bladder is washed out with sterile water or a weak antiseptic solution, then distended with the same fluid and the cystoscope introduced. The ureteral orifices are situated at the base of the trigone, one at either angle and appear as small slits in the vesical mucosa. When they are located the ureteral catheter is made to enter one orifice and passed upward by a slow rotary movement for a distance of about 5 centimeters. The same procedure is then repeated on the other side.

The cystoscope may be left *in situ* while the urine is being collected, or it may be withdrawn, leaving only the catheters in place. With the improved modern cystoscopes the latter procedure is easy and is less disturbing to the patient.

The urine is collected in sterile glass tubes, every precaution being taken to prevent contamination.

URETHANE.—Ethyl carbamate, $C_3H_7NO_2$, is an ester of carbamic acid, obtained by the reaction of ethyl alcohol upon carbamid (urea) or one of its salts. It occurs in colorless crystals, readily soluble in water, alcohol, ether, or glycerin. Dose, 10 to 30 grains; but is best given in doses of 5 grains frequently repeated, up to 20 grains or more, as a full dose may cause vomiting. It is incompatible with many substances, and is best administered by itself. Urethane is a mild hypnotic for adults, but a safe and efficient one for children. It stimulates the respiration, and in medicinal doses does not affect the circulation; but in very large quantities it slows the heart, depresses the body temperature, and induces muscular relaxation and some degree of general anesthesia.

URETHRA (FEMALE), DISEASES. Inflammation.—Inflammation of the female urethra is almost invariably due to gonorrhea. It may occasionally be due to traumatism, chemic irritants, drugs, and the exanthematous diseases.

Symptoms.—In acute urethritis there is frequent and painful urination. In severe cases blood may appear in the urine. The external meatus is inflamed and swollen, and pressure over the course of the urethra is accompanied by intense pain and by the discharge of a few drops of pus. As the disease becomes chronic the severe symptoms subside; there is little or no pain. Pressure over the urethra reveals some tenderness, and, if the patient has not urinated recently, will probably cause the discharge of a drop of pus. Endoscopic examination will show localized areas of inflammation.

The treatment in the acute stage should consist of rest in bed, a nonstimulating diet, diluent drinks, and rather free purgation. A very good plan is to put the patient on an exclusive milk diet. The external genitals should be cleansed several times daily with hot boric acid solution (1 dram to 1 pint). After the first two or three days of the attack salol, oil of sandalwood, cubebs, or copaiba, in 5-grain doses, may be given 3 or 4 times daily. If this treatment is ineffectual, irrigation of the urethra with sterile water should be tried, followed by the injection of a solution of nitrate of silver, 2 grains to 1 ounce. In injecting solutions of any kind into the urethra it should be remembered that its capacity is not more than 10 or 15 drops. Occasionally, the condition will persist in spite of this treatment. Such cases require applications of a stronger solution of nitrate of silver (10 grains to 1 ounce) directly to the affected areas through the endoscope.

Caruncle.—See CARUNCLE (Urethral).

Polypus.—Polypi of the urethra are mucous in character. They cause no symptoms except that of obstruction to the flow of urine. They should be excised.

URETHRA (MALE), HEMORRHAGE.—Hemorrhage from the urethra may be caused by the introduction of a bougie, by the opening of a false passage, by the separation of a slough formed by the caustic bougie, or by the rupture of a blood-vessel during acute chordee, or it may result from internal injuries. It may occur from general arterial excitement or may be associated with HEMATURIA (*q. v.*).

Treatment.—The recumbent posture, with application of cold and pressure, should be tried. A flat piece of cork should be pressed by the patient against the perineum, far back, and gradually moved forward until it reaches the right spot, when the dripping of blood will cease. A solution of tannic acid in water may be used as an injection. Gallic acid may be of service. Adrenalin solution has proved efficient. A steel bougie, first put in very hot water and then introduced into the urethra, is often used to arrest this variety of hemorrhage. If the hemorrhage is from the anterior portion of the urethra, a catheter should be inserted and a bandage firmly applied around the penis.

URETHRA (MALE), INJURIES.—**Rupture of the urethra** is a serious injury, as it exposes the patient not only to the immediate danger of extravasation of urine, but also to the lifelong trouble of a traumatic stricture. It is generally caused by a kick on the perineum, by a fall astride a joist or rail, or by the displacement of a fragment of the pubic arch in fracture of the pelvis. The urethra may also give way behind an old stricture while the patient is straining to empty his bladder.

State of the Parts.—The rupture usually occurs where the urethra passes under the pubic arch: *i. e.*, either just in front of or just behind the triangular ligament. In the former situation urine and blood will be extravasated in the perineum; in the latter, about the neck of the bladder. As the triangular ligament, however, is generally torn, some urine will, as a rule, in the latter case also pass forward into the perineum. The urethra may be completely torn across, or the rupture may only be partial, the upper wall escaping.

The symptoms are usually quite obvious. Together with the history of an accident there will be pain, swelling, and the ecchymosis of the perineum, and escape of blood, often in considerable quantities, from the urethra. The patient is unable to pass water, and any attempt to do so merely forces more urine into the tissues of the perineum, and gives pain. On trying to pass a catheter, some obstruction is generally met with, and will often prove insurmountable; but if the catheter is finally passed, clear urine will escape. These signs distinguish it from ruptured bladder, in which injury the catheter passes easily, but, generally (although the bladder is said to have been full at the time of the injury), only a little urine flows. In mere bruising and ecchymosis of the perineum the catheter will pass easily, and there is, as a rule, no escape of blood from the urethra. See HEMATURIA, URINE (Examination).

Treatment.—A soft catheter should be passed, if possible; if not, a gum-elastic or a silver one; and, in any case, the catheter should be tied in. Failing to pass a catheter, an extravasation of urine in any quantity having already occurred, a silver catheter should be passed down to the obstruction and a free incision through the middle line of the perineum made on its point. If the proximal end of the torn urethra can now be found, the catheter should be passed through it into the bladder and tied in. If not readily discovered, a prolonged search for it need not be made, as with a free incision through the perineum there is no danger of further extravasation of urine. If the urethra is found only partially torn across, an attempt should be made to bring the edges together by suture over a catheter, the external wound in the perineum being then united by deep sutures. The catheter should be kept in place for a week. Should a fragment of the pubic arch be found compressing the urethra, steps must be taken to remove it, the bladder in the mean time being aspirated above the pubes to prevent further extravasation occurring. When the wound in the perineum is left to granulate in the ordinary way, a silver catheter—as the point of this is more under control than that of a soft one—should be passed daily during the healing of the wound, and the patient should be enjoined subsequently to pass one for himself at frequent intervals, and warned that if he neglects to do so, a stricture will gradually form (Walsham).

Foreign bodies introduced into the urethra require extraction. Urethral forceps should be avoided as far as possible; sometimes, by placing the patient in a hot bath, giving him plenty of liquid to drink, and directing him to retain his water, sufficient can be withheld to drive out such an obstruction, for example, as the end of a catheter broken off in a stricture; but this should not be tried too long. Hair-pins, on the other hand, and such structures, nearly always require incision. The cases in which the obstruction is slight and a stone lies out of the way are much more rare, and, as a rule, occur only in elderly men. In a few instances huge cylindric calculi have been found, 3 or 4 inches in length and 1 1/2 inches in circumference. These generally lie in the tissue by the side of the urethra, occupying a cavity which they have worn out for themselves, and sometimes they are so invested by the mucous membrane that a sound may be passed down by them without any characteristic grating.

URETHRA (MALE), STRICTURE.—In the male, stricture may be either congenital or acquired. Congenital stricture occurs but rarely, and is usually confined to the meatus. Acquired stricture may be defined as an abnormal lessening of the caliber of the urethra, or of the dilatability of the urethral canal, associated with changes in the mucous, submucous, or muscular structures constituting its walls. This definition embraces the varieties of strictures known as inflammatory, spasmodic, and organic.

Inflammatory stricture is a narrowing of the caliber of the urethra, due to inflammation; it is usually of short duration, is seldom attended with retention of urine, and is frequently the starting-point of organic stricture.

Spasmodic Stricture.—This condition is due to contraction of the muscular fibers of the urethra; it is frequently reflex in character, as is shown by the retention of urine that sometimes follows surgical operations on the anus, rectum, penis or scrotum. It may be caused by shame, fear, or anger, or by a hyperesthetic condition of the canal.

Organic stricture may exist in either sex. In the male it occurs early in life; it is most common between the ages of 25 and 45. It is caused by long-standing urethritis, by traumatism, and, according to some authorities, by masturbation.

Symptoms.—As a rule, it will be found that the individual has suffered one or more attacks of urethritis within a year or two previous to presenting himself for treatment. A frequent desire to urinate, more urgent during the day, is usually one of the early symptoms; the stream is much reduced in size, and may be forked, twisted, or spray-like. After the stricture has existed for some time and atony of the bladder has developed, there will be marked diminution of the expulsive force. Dribbling from the urethra is frequently an early symptom, depending on the condition of the circular muscular fibers of the urethra. Late in the disease incontinence of urine sets in, which is the so-called "incontinence of retention;" it is more persistent during the day.

When inflammation of the prostate or bladder exists, ardor urinæ will prevail. The same causes may give rise to vesical tenesmus. Urethral discharge is present in about 50 percent of the cases, and is usually of a mucoid character; retention is, as a rule, a late symptom, and is caused by exposure to cold, unusual exertion, alcoholic excess, or immoderate coition.

Strictures of very small caliber may markedly interfere with the act of coition: the stricture becoming congested during the sexual embrace, prevents the semen from passing forward, and it slowly dribbles away after the erotic act has terminated.

In cases of long standing in which a diseased condition of the bladder and kidneys exists, associated with alternation in the character of the urine, there will frequently be found well-marked constitutional symptoms, such as uremia and septicemia.

Treatment.—The patient must be carefully examined, so as to ascertain the number, position, caliber, resiliency, and relative irritability of the strictures. The condition of the bladder and kidneys must be determined, and a microscopic and chemic examination of the urine must be made, to decide whether any pus, mucus, or blood is present, or whether any casts are to be found. If possible, a bacteriologic study of the urine should be made, as the presence of pathogenic organisms has often a great bearing on the treatment of the case. The quantity of urine passed during 24 hours should be fixed upon and the amount of urea clearly ascertained, together with the aggregate of albumin and sugar. Having obtained these data, the surgeon will be enabled to decide upon the proper operation to be performed.

The numerous methods resorted to for the extirpation of urethral stricture are: (1) Gradual dilatation; (2) continuous dilatation; (3) modified rapid dilatation; (4) internal urethrotomy; (5) dilating internal urethrotomy; (6) dilating internal and external perineal urethrotomy; (7) external perineal urethrotomy with guide; (8) external perineal urethrotomy without guide; (9) electrolysis; (10) urethrectomy; (11) divulsion.

1. Gradual Dilatation.—This is the treatment usually pursued for the relief of stricture, and is by far the safest method, death never having followed its employment. In soft recent strictures the number of permanent cures resulting from gradual dilatation compares favorably with those treated by internal urethrotomy, without incurring the risk attendant upon the latter operation.

To perform gradual dilatation properly the character, position, and caliber of the stricture should be closely ascertained by means of the bougie à boule. If possible, the operator should commence dilatation while the caliber of the stricture is not dense. The instrument to be used should be a conic steel bougie one or two sizes smaller than the contraction, as more or less hyperesthesia of the urethra usually exists, and the onward progress of an instrument large enough to fill or distend the stricture gives rise to great pain, causing more or less spasm and interfering with the passage of the bougie. The canal in the neighborhood of the obstruction is likely to be congested, chronically inflamed, and softened. If there is much distention, the mucous membrane is easily lacerated. Laceration is followed by pain after micturition, with the discharge of more or less blood. In rare cases urine is absorbed into the system by reason of abrasion or laceration, giving rise to urinary fever. By commencing with a bougie of a smaller diameter than the caliber of the stricture, this complication is frequently avoided. The confidence of the patient is gained if the instrument produces but little pain, and thereby more progress is made than if force were used.

The best rule is to increase the size of the instrument as the pain of insertion diminishes and as the amount of blood following the introduction becomes less. The instrument should not be introduced more frequently than every third day, and should be immediately withdrawn after insertion.

Before using an instrument, both it and the urethra itself should be made thoroughly aseptic. Palmer has shown the value of boric acid in sterilising the urine, administered when the patient is placed under treatment. It should be given for 2 weeks in doses of 10 grains 3 times daily.

Urinary fever is most likely to occur at the begining of the treatment, when the mucous membrane of the canal is in a condition of subacute inflammation and is somewhat softened. This may be avoided by the use of boric acid.

Examination of the urethra by means of the endoscope will show how rapidly the inflammatory symptoms disappear in the neighborhood of the stricture when partial dilatation has been accomplished. This change possibly accounts for the rapid amelioration of the local symptoms—indeed, it commences after the instrument has been passed but a few times, and before the normal caliber of the urethra has been restored.

The length of time the treament should be continued will vary with the condition of the obstruction to be overcome. If the stricture is extensive, about 3 months will be required to restore the urethra to its normal size. During this time the patient is to be instructed in the use of the instrument, which he should be directed to pass twice a week for a period of 2 months; after which he must use it once a week for a similar period, then once in two weeks, and finally once a month. The treatment may then be discontinued, the patient being directed to return to the use of the instrument whenever there is an indication of a tendency to recurrence to an abnormal condition.

By faithfully employing the instrument when necessary, the patient can always keep the urethra patulous, and need suffer no further urinary difficulty. In cases of stricture of very small caliber a much longer time will be required to bring about permanent good results. Gradual dilatation may be employed for years, with every advantage to the patient, no symptom of contraction making its appearance nor any indication of trouble from the prolonged use of the bougie.

Recent strictures frequently disappear altogether when the method here prescribed is pursued, when the further use of the instrument may be dispensed with.

Gradual dilatation is indicated in all cases of recent dilatable stricture in any portion of the urethra, or when the stricture is not irritable, resilient, or nodular. Firm, well-organized bands situated within from 3 1/2 to 4 inches from the meatus may require other measures for their obliteration.

When diabetes or advanced disease of the kidneys exists, gradual dilatation is far more safe than any other method of procedure. This, too, is the proper treatment for those suffering from debility, or from disease of the heart, and for individuals broken down in health, and for the very old, especially if chronic urinary fever coexists.

In many cases one of the cutting operations may be advised instead of dilatation, but experience teaches that when a well-organized stricture exists, urethrotomy is as frequently followed by recontraction as is dilatation, the patient at the same time running the greater hazard that always follows a cutting operation, with very little, if any, better chance of permanent benefit in his favor.

It cannot be denied that every urethrotomy is attended with more or less risk to the patient, while dilatation is perfectly safe; moreover, the further the division of the stricture is made from the meatus, the greater will be the danger from the operation.

Death has followed shock after simple division of the meatus. Even in the hands of the most experienced operators the death-rate from internal urethrotomy is 2 in every 100 cases.

Taking the dangers of the cutting methods into consideration, and the fact that they are rarely followed by permanent results, it would seem to be obligatory on the part of the surgeon to give the uninformed the option of the safest course. If the cure from the cutting operations were radical, and if the strictures did not recontract in a large percentage of cases, it would doubtless be the duty of the practitioner to allow the patient to run the risk of urethrotomy; but as the result is by no means certain by any method now employed, there should be no hesitancy in recommending a course that, while it has its disadvantages, yet relieves the symptoms due to obstruction and is absolutely safe.

2. **Continuous Dilatation.**—In resorting to continuous dilatation, the surgeon should begin with a very small instrument, a filiform bougie being usually employed. This must be allowed to remain *in situ* for 3 days, when, as a result of the continuous pressure, the stricture relaxes sufficiently to allow of the introduction of a larger instrument. As a rule, the tunneled catheter is the instrument to be used; this is passed over the whalebone and through the obstruction into the bladder. After this the surgeon is free to deal with the stricture in any manner that he may prefer.

There are two conditions under which this method of treatment is applicable: First, when there is a stricture of small caliber, usually situated in the membranous portion of the canal, and generally accompanied by retention of urine; second, when, although the stricture is tight, the patient is enabled to pass urine with sufficient ease to allow him to be prepared for a radical operation.

In the first instance, when a filiform bougie has been inserted, a Gouley tunneled catheter should, if possible, be threaded over the whalebone and passed through the obstruction, and the urine should then be withdrawn. Should the effort to pass the catheter be unsuccessful, the filiform bougie should be retained in place by means of appropriate dressings, so that it cannot be expelled from the urethra. If the symptoms are urgent, the bladder must be aspirated. If the viscus is not overdistended, the patient should be given 1/2 grain of morphin and should be immersed in a hot bath, when he will have but little further trouble in passing his urine. The stricture should then be treated as the surgeon may deem most expedient.

Under the second condition, continuous dilatation is employed simply to enable the operator to overcome the contraction by the use of either gradual or modified rapid dilatation, or to enable him to enlarge the stricture sufficiently to pass a Syme's staff, and thus facilitate the performance of external perineal urethrotomy, should this operation be indicated.

The failure of many practitioners to use filiform bougies successfully arises from various causes: the instruments usually sold are often worthless: they are too stiff, not well rounded, do not terminate in a proper neck, and are generally too large to be threaded over the smaller sized catheters. The surgeon should make his own filiform bougies; a dozen, properly constructed, will, with ordinary care, last through several years of active practice. An important rule to follow is to employ the filiform before any bougie, catheter, or other instrument has been introduced into the urethra. If an instrument has been previously used, it is of very little avail to attempt to pass a filiform, as failure will generally result. Great patience is a necessary element of success.

It is well first to inject two drams of adrenalin solution 1 to 4000, let the patient hold it in the urethra for two or three minutes, and then distend the canal by gently injecting a syringeful of warm carbolized oil before inserting the filiform, which has been rendered aseptic, and which is to be introduced into the meatus and passed slowly down to the obstruction, while at the same time the patient's face is carefully watched for the slightest expression of pain, which is an indication that the onward passage of the filiform must cease. The slightest impediment to the passage of the bougie should warn the operator that he has proceeded far enough with the instrument, when a second should be introduced in the same manner, and the process thus repeated until 6 or 8 whalebones have been inserted, when the operator very gently tries each in turn, to see if he can find the opening in the obstruction; beginning on the left and passing to the right side of the patient, the surgeon naturally tending to work toward himself.

If the stricture is excentric, the opening will probably be found by this manipulation; the instrument will glide through the contraction with little or no pain, when, without force being required, it will pass into the bladder, and will be freely movable in the urethra.

These instruments are frequently made with a spiral twist at the end, on the supposition that the physician can more readily pass such a one should the stricture be excentric. However, perfect success with the straight instrument is always possible.

In order to successfully insert a tunneled catheter over the filiform through the stricture, the instrument should be gently passed down to the obstruction, then transferred from the right to the left hand; and while the right hand keeps the penis on the stretch, the filiform is to be withdrawn about 1/4 of an inch, and then both the filiform and the tunneled catheter are to be carried together through the contraction. This procedure prevents the catheter from cutting the filiform into two fragments, and assists in guiding it through the obstruction.

This method of treatment is of great value as an adjunct to the employment of more radical measures. It is of service in relieving retention of urine due to strictures of small caliber, in preparing the canal for gradual or modified rapid dilatation, and in permitting the passage of a staff for external perineal urethrotomy.

If a stricture exists in the neighborhood of the bulbous or membranous portion of the canal, and is not irritable, resilient, or nodular, the employment of continuous dilatation should be followed by the gradual method; and if this is not practicable, modified rapid dilatation is strongly recommended.

3. **Modified Rapid Dilatation.**—The operation to which this name is given is not in favor with many genitourinary surgeons, but undoubtedly gives good results in strictures of small caliber situated in the membranous portion of the urethra.

The patients thus operated on are confined to the house but 4 days, at the end of which time they are allowed to go about, with directions to report to the surgeon at intervals of 3 days in order to have a full-sized bougie inserted, which they soon learn to use themselves. The treatment is to be continued as advised when speaking of gradual dilatation.

It is not observed that strictures thus treated show any greater tendency to recontract than those on which either internal or external urethrotomy has been performed, especially if dilatation is continued afterward.

To carry out this method of treatment properly the patient is to be put to bed, the urethra washed out with a 4 percent solution of boric acid, and an aseptic filiform bougie passed and tied in place. The patient is then given 10 grains of boric acid 3 times daily, and the urethra is to be irrigated daily with boric acid solution; at the end of the third day he is etherized and the urethra is washed with a 1:20,000 mercuric chlorid solution. The Thompson dilator is then passed over the filiform and through the obstruction, when, by means of the thumb-screw attached to the handle, the blades of the instrument are slowly and very gradually separated to a very slight degree; after remaining in this position for 1 minute they are again approximated.

This procedure of alternate separation and approximation is to be repeated, taking care each time to separate the blades of the instrument to a somewhat greater extent, until the stricture is enlarged sufficiently to allow of the insertion of a Gross dilator, which requires that the caliber of the urethra should not be less than 18 F.

The Thompson instrument is then removed, and the Gross instrument inserted. In the same gradual manner the caliber of the urethra is brought to the full size of the canal, which has previously been ascertained by means of a bougie à boule.

Strictures so treated are stretched rather than lacerated or torn; this is shown by the small amount of hemorrhage that follows. On examination with the endoscope two weeks later the walls of the urethra will be found to be smooth, and not ragged, as would be the case if laceration had taken place.

After the Gross instrument is withdrawn, a full-sized bougie is passed, to ascertain whether all obstruction has been dislodged; if this is found to be the condition, the urethra should be irrigated with a 1:20,000 mercuric chlorid solution, and a sterilized catheter passed and tied in place; then a small quantity of warm boric acid solution is to be injected into the bladder. The patient is put to bed; the urethra and bladder are to be irrigated daily with a warm boric acid solution, and on the fourth day the instrument is to be removed and a full-sized bougie passed, The patient is allowed to sit up, and may resume his vocation on the following day.

This method is applicable to the treatment of filiform strictures in the neighborhood of the bulbous and membranous portions of the urethra, which are not irritable, resilient, or nodular, and which cannot be treated by gradual dilatation. It likewise is not convenient when time is an object, as, for instance, when the individual is about to undertake a journey or is about to be married. It should not be performed on the aged, or on those suffering from disease of the kidney, urinary fistula, or abscess of the perineum. In many cases in which the stricture is resilient, the caliber very small, and a perineal section is indicated, this operation may be employed primarily to facilitate the passage of the grooved staff, immediately afterward performing the cutting operation.

It would seem that an operation that is so free from complications, attended with so little danger to life, and that at the same time produces such favorable results, with no greater tendency to relapse than is to be encountered after other methods, is entitled to a prominent place among the resources that the surgeon possesses wherewith to overcome obstructions in the bulbous and membranous portions of the urethra.

When it is observed that in performing this operation the stricture is dilated gradually, and that an effort is simply made to restore the contracted portion of the canal to its normal caliber, that it is not overdilated, and that in conjunction with the operation the strictest aseptic and antiseptic precautions are employed, it will be seen that it differs very materially from the method of divulsion, which should become obsolete.

4. **Internal urethrotomy** should be limited to well-organized strictures situated within 3 1/2 or 4 inches from the meatus. If they are of such small caliber that a urethrotome cannot be passed, they should be first cut on the roof of the urethra, from before backward, and the constriction should be divided on the floor of the canal by the cross urethrotome, which, being of the shape of a bulbous bougie, locates the constricting band with great exactness. Stricture of the meatus and of the neighborhood of the fossa navicularis should be divided on the floor of the urethra, especially if they give rise to reflex symptoms.

5. **Dilating internal urethrotomy,** though very thorough, is not indicated in many instances the operation being frequently followed by reformation of the stricture. Its sphere of usefulness is confined to those conditions in which the stricture is well organized, of long standing, situated within 3 1/2 inches of the meatus, and is either nodular or resilient. In the latter condition it is the only operation that offers permanent relief; but unless the patient employs the bougie in the manner recommended when treating of gradual dilatation, the contraction will be likely to return.

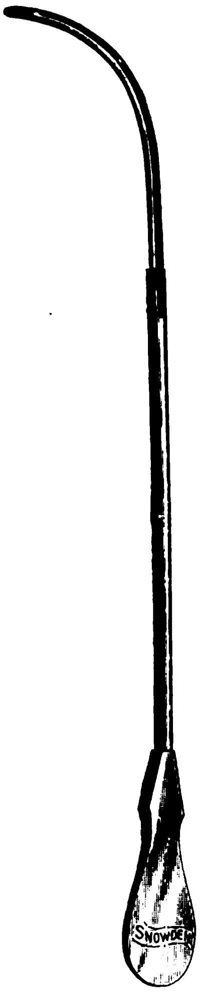
Dilating internal urethrotomy should not be employed in a case of ordinary stricture of the penile portion of the canal, unless it is complicated in the manner already described, as the operation will probably be followed by a curvature of the penis, which may last for a period ranging from 6 weeks to a year, and is, of course, a source of great mental anxiety to the individual. What is far worse is that the knife of the instrument cuts so deeply that an extensive division of the muscular fibers of the urethra follows, and, as a result, dribbling after the act of micturition takes place; as the canal is unable to expel the last drops of urine, it slowly oozes from the meatus. This condition is permanent.

If it can be avoided, dilating internal urethrotomy should not be performed on persons suffering from impotence, neurasthenia, abnormal nocturnal losses, or sexual hypochondriasis. Very naturally, the incurvation of the penis and the dribbling of the urine produce very depressing mental effects on the patient, which are difficult to overcome. When these complications exist, it is preferable to rely upon internal urethrotomy by means of the Gross instrument.

6. **Dilating internal and external perineal urethrotomy** is relied upon for the relief of nodular strictures of the penile portion of the urethra, and of strictures of the bulbous portion of the canal. The object in opening the membranous portion of the canal, in cases of nodular strictures situated in the anterior portion of the urethra, which have been divided, is that the parts may be put at complete rest, and that the indurated tissue of which they are formed may be allowed to undergo fatty degeneration, atrophy, and absorption.

Dilating internal and external perineal urethrotomy has frequently been modified, with good results. The strictures upon which this method was resorted to were situated about 2 1/2 inches from the meatus, were nodular, resilient, and of very small caliber. By means of the Maisonneuve instrument they were divided on the roof of the canal, and the insertion of the Otis dilating urethrotome thus permitted; the constricting bands on the floor were freely divided, and the caliber of the urethra brought to its full size. A Jacques' catheter was then passed, fastened in place, and allowed to remain *in situ* for 2 weeks, temporarily removing it every third day for the purpose of sterilization. The urethra and bladder were daily irrigated with a boric acid solution. The induration around the seat of the stricture disappeared, and the patients recovered without complicating the cases by the addition of perineal puncture.

7. **External Perineal Urethrotomy by Means of a Guide.**—The membranous urethra is opened, the surgeon being guided in reaching that portion of the canal by either the filiform bougie, a Gouley tunnel catheter, Thompson's dilator, or a Syme's staff. This operation is indicated in nondilatable, resilient, nodular strictures of small caliber, in obstructions of the canal associated with fistulæ and abscesses of the perineum, and in conjunction with internal urethrotomy performed upon some part of the penile portion of the urethra.



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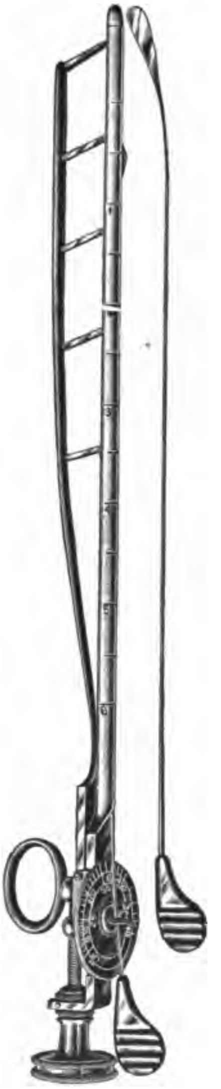
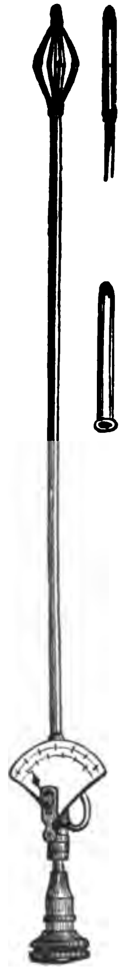


OTIS' DILATING URETHROTOME.



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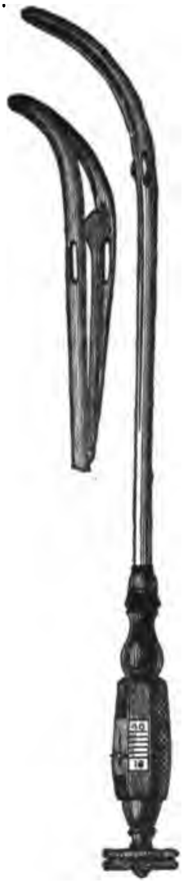


GROSS' DILATOR.

8. **External perineal urethrotomy without a guide,** generally known as "**perineal section,**" is performed when no guide of any kind is passed into the canal. It is generally employed in the cases of stricture of traumatic origin, of obstructions associated with fistulæ and abscesses, and when false passages exist, with retention of urine. It may be performed by carefully dissecting down upon the urethra until the obstruction is found, and then cutting through the stricture, a procedure known as the "Wheelhouse operation." Another method is sometimes employed, known as "Cock's operation."

With the aid of a modification of the Wheelhouse staff designed by Horwitz, the operation known by the name of that surgeon is very materially altered and simplified. Horwitz's staff consists of two blades in close approximation, which together form a smooth rod with a thumb-screw at one end, by means of which the blades may readily be separated, working upon the same principle as the Otis dilating urethrotome. The distal end of the instrument terminates in a rounded nut, which can be removed or replaced by a whip filiform; the nut on the end is tunneled, so that an ordinary whalebone filiform can be passed. The filiform is employed when it is not possible to insert the whip bougie, as it frequently happens that the former instrument can be introduced when the passage of the latter cannot be achieved; so that the staff can be employed with either an ordinary filiform or a whip bougie, or without any guide.

When it is possible to introduce the whip bougie through the stricture, it is to be fastened to the perineal staff. The blades of the instrument are closed and then passed into the urethra until arrested by coming in contact with the shoulder of the stricture. The whip bougie being pushed in front of the staff, reaches the bladder and curls up, and when the urethra is opened, serves as a guide to the operator, as it passes directly through the stricture.

In case the whip bougie cannot be passed through the stricture, a whalebone filiform should be inserted; the tunnel at the end of the staff is threaded over with a filiform and is introduced into the urethra until arrested at the contracted portion of the canal.

By means of the thumb-screw the blades are separated, and thus the urethra in front of the stricture is not only fixed, but is made prominent, and the operator, after making the incision through the skin, can readily open the urethra with absolute precision and ease.

If the stricture is impassable and the operation must be performed without a guide, the staff is to be passed down to the seat of contraction; when this point is reached, the blades are to be separated and the urethra fixed and made prominent, when the urethra can be opened in front of the stricture by a few touches of the knife. The modification in the techinc of perineal section will now be considered.

When the patient is placed on the operating table, an effort is to be made to introduce the whip bougie; should this fail, a filiform is inserted, over which is threaded the perineal staff, which is passed down to the strictured portion of the urethra; the blades are then separated and the instrument given to an assistant to hold, who at the same time lifts the scrotum well out of the way. The individual is then placed in the lithotomy position, the buttocks projecting slightly beyond the edge of the table. A free incision is made along the perineal raphe, and the structures overlying the urethra are divided until the canal is exposed at the bottom of the wound. A tenaculum is then passed into the urethra on each side of the staff, and placed in the hands of the assistant who has charge of the leg, with directions to make gentle traction; this brings the urethra prominently into the wound, where it can be readily incised in front of the stricture, when the staff is exposed *in situ*. The Wheelhouse probe is then utilized to search for the mouth of the stricture; as soon as it is disclosed, the probe is to be inserted by the side of the filiform and passed backward until it enters the bladder; it is then handed to an assistant to hold.

With the index-finger of the left hand in the rectum as a guide, and in order to prevent injury to the bowel, a probe-pointed bistoury is passed along the groove on the under surface of the staff, so as to divide the stricture throughout its entire length; after which a Teale gorget is to be inserted beside the probe until the instrument enters the bladder. The probe is then to be removed and a soft-rubber catheter passed through the penile urethra until the point of the instrument appears in the perineal opening, when it is to be seized by the surgeon between his finger and thumb, pulled well into the incision, and made to pass along the gorget until it reaches the bladder; the urethra, perineal wound, and bladder are then to be irrigated with a solution of 1:20,000 bichlorid of mercury, and the perineal wound dressed in the usual manner.

In cases in which neither a whip bougie nor a filiform can be made to pass the stricture, a method precisely similar to that just described should be pursued. It sometimes happens that, owing to infiltration against the compact tissue, it is impossible, after the most careful search, to find the proximal end of the urethra. Should the operator be unable to discover the opening to the strictured portion of the canal, the bladder should be opened after the method suggested by Cock. If the patient is in poor physical condition, or if suffering from chronic disease of the kidney, or if he has sustained a rupture of the urethra, with infiltration of urine, valuable time should not be wasted in attempting to reach the bladder through the perineum; the proper method is to proceed at once to perform retrograde catheterization.

Cock's Operation.—The surgeon having failed to pass any instrument through the strictured portion of the urethra to serve as a guide, the patient is to be placed in the lithotomy position; the index-finger of the left hand is introduced into the rectum, and its tip kept in contact with the apex of the prostate gland. A double-edged knife is then thrust directly into the median line of the perineum about one inch above the sphincter ani, and carried toward the tip of the finger in the rectum, opening the urethra at the junction of the membranous and prostatic portions of the canal.

9. **Electrolysis.**—Of 15 cases treated by this means, all did badly: either urethritis, prostatitis, cystitis, or epididymitis followed; and this mode of treatment was necessarily abandoned. In one case slight improvement followed; this was due to the gradual dilatation produced by the electrode. Fort, of Paris, has devised special instruments for this operation, from the use of which he claims to have obtained most excellent results. The experience of genitourinary surgeons throughout the United States is against its general adoption or its value in ordinary cases. It is therefore not recommended.

10. **Urethrectomy.**—This treatment is reserved for traumatic strictures, attended by great resiliency, which promptly recontract, in spite of every effort, after a most thorough and complete operation. It consists in either partial or complete excision of all the nodular and strictured tissue, which is dissected away by means of an incision in

the perineum, a new urethra being formed around a retained catheter.

11. **By divulsion** is understood the passing of a dilator so as to rupture the contracting band. Divulsion of a stricture by Holt's instrument is generally condemned as dangerous to life, as has been abundantly proved by a large mass of clinical testimony. Safer methods offer better results.

URETHRAL CALCULUS.—Calculi are occasionally formed in the urethra, in the dilated and fasciculated pouch that develops behind a stricture; but the nucleus is nearly always carried down from the bladder. The symptoms depend upon the degree of obstruction: if the calculus is large enough to occlude the urethra itself, or is so sharp and angular as to bring about the same result by the spasm that it excites, retention occurs; and if speedy relief is not given, ulceration and extravasation follow. If, on the other hand, it is small and is lodged in a diverticulum, it may continue to increase from the deposit of phosphates on its surface, and to wear its way into the tissues, until at length it forms an enormous mass, lying in the substance of the penis, alongside the urethra, almost buried under the mucous membrane.

Impacted calculus is more common in children than in adults, owing to the greater frequency of stone in childhood and to the small size of the urinary passages. The calculus is washed down from the bladder during the act of micturition and is suddenly arrested, generally in the membranous part or at the meatus.

Symptoms.—The stream stops suddenly, there is a sharp, cutting pain at the end of the penis, with violent straining, and perhaps a few drops of blood exude from the urethra, especially if the calculus is sharp and angular. For a time the straining continues, the bladder becomes more and more distended, and then either sudden extravasation occurs, or, if a small quantity of urine can escape by the side, so that there is not such immediate tension, inflammation sets in, ending in urinary abscess and fistula.

Diagnosis.—There is seldom difficulty in the diagnosis. The history of the case, the way in which the child screams and pulls at the end of its penis, the retention of urine, which is so rare in children from any other cause, and the few drops of blood are distinctive. Very often the calculus can be felt from the outside. If it cannot be felt, a small catheter may be passed down the urethra; sometimes it comes to an abrupt stop against the stone; sometimes it slips by the side of it with a rough, grating sensation, and, entering the bladder, gives relief for the moment. If any time has elapsed since the accident, the bladder may be distended up to the pubes; or there may already be a swelling in the perineum, due to inflammation and commencing extravasation.

Treatment.—A calculus in the penile part can generally be worked forward with the fingers until it reaches the orifice, when a small incision may be necessary to extract it. If this is not successful, a scoop or pair of urethral ("alligator") forceps may be passed down the urethra, and an attempt made to draw the calculus forward; but this may inflict serious injury upon the mucous membrane. If it is fixed or is too far back for this, the patient should be placed in the lithotomy position, the skin over the projection stretched with the finger and thumb of the left hand, and a small median incision made down upon it. Generally the calculus springs out at once, and the wound may be left to granulate. The bulb should, if possible, not be incised. If the calculus is near the neck of the bladder, it should either be removed by the median operation or pushed further back and crushed with a lithotrite.

URETHRITIS.—See GONORRHEA.

URETHROSCOPE.—See ENDOSCOPE.

URETHROTOMY.—See URETHRA (Male) (Stricture).

URIC ACID.—See URICACIDEMIA, URINE (Examination).

URICACIDEMIA.—A constitutional disease arising from disturbed metabolism and an accumulation of uric acid in the blood, and characterized by an excess of uric acid in the urine, by disturbed digestion, and by various nervous symptoms. It differs from gout chiefly in the absence of deposits of urates in the small joints and in the absence of localized manifestations.

Synonyms.—Lithemia; lithic acid diathesis; uric acid diathesis; latent gout; lithuria.

Etiology.—Hereditary influences, overeating, alcoholic excess, impaired digestion, sedentary habits, insufficient exercise, and mental anxiety, with loss of sleep are the principal causes.

Symptoms.—It may be said that, as a rule, in lithemia the **nervous symptoms** are vague, such as insomnia, pains in the lumbar region, headache, neuralgia, and mental hebetude. The **circulation** is sluggish, and the patient complains of cold feet. Tonsillitis is common.

Gastrointestinal Symptoms.—In these cases constipation exists, and the tongue is furred. The appetite may be poor or sometimes may be abnormally large. The digestion is always bad and gastralgia and acid dyspepsia may coexist.

Urinary Symptoms.—In nearly every case the urine is loaded with uric acid and the urates. The urine is usually high colored, scanty, acid in reaction, and may cause pain on micturition. See URINE (Examination).

Sequels.—Arteriosclerosis, interstitial nephritis, cirrhosis of liver, gastralgia, dyspepsia, and probably nerve lesions not yet understood.

Diagnosis.—There are but few diseases in which the importance of the examination of the urine is greater. A disease with such vague nervous and gastrointestinal symptoms may simulate any number of other affections, including malaria (very common), rheumatism, and diseases of the brain and of the spinal cord.

If uric acid is present in a sample of urine, it is not absolutely diagnostic of lithemia; but with the history and other symptoms it is not likely that the diagnosis will be mistaken. Next in importance to the examination of the urine is a correct and complete history. It is very often a disease of neglect, and the patient, as a rule, does not consult the physician until its progress has far advanced, and until the accumulation of the uric acid in the system produces the manifold symptoms which each patient can so accurately portray.

Treatment.—Few diseases yield so rapidly to proper treatment, and a system of hot baths, salines, cathartics, and diuretics may yield truly brilliant results. Meats, coffee, tea, alcohol, malt liquors, and especially tobacco are to be restricted to the greatest degree, and foods easily digested are indicated. All kinds of fruit and vegetables may be eaten, and the diet should be composed principally of these articles. Fats and desserts should be shunned. The bowels, kidneys, and the skin must be kept active by medicines, massage, and the proper amount of outdoor exercise.

For the constipation:

℞.	Tincture of nux vomica,	ʒ ij
	Fluidextract of cascara,	℥ jss
	Glycerin, enough to make	℥ iij.

One teaspoonful at bedtime.

Constipation may often be relieved by a pill containing:

℞.	Strychnin,	gr. ss
	Extract of belladonna,	gr. iij
	Aloin,	ʒ ss.

Divide into 30 pills. One pill 3 times daily.

Purgative salines may be used, such as Carlsbad salts (1/2 ounce), Rochelle salts, or any of the purgative or laxative mineral waters, such as the Hunyadi and Apenta. Sodium phosphate may be given morning and night. For the kidneys almost any diuretic may be given. Free use of drinking-water is advisable.

To keep the skin active, hot baths should be taken in the middle of the day, 3 times a week. Thorough massage following the baths greatly enhances the value of this treatment. See ACIDITY, AUTOINTOXICATION.

URIDROSIS.—See SWEAT GLANDS.

URINARY CALCULI.—Urinary calculi are found in the kidney, ureter, bladder, and urethra. They may be formed from any of the sediments that occur in urine, but the tendency *is* much greater in the case of some—uric acid, for example—than in the case of others, such as phosphate of lime. The animal matter that holds the particles together is derived from the mucus of the urinary tract, which undergoes a process of fermentation, and either collects layer after layer of uric acid or leads to the formation of sparingly soluble oxalate of lime.

Origin.—The nucleus of a calculus may be hollow or may consist of dried blood; in most calculi, however, it is formed of uric acid or oxalate of lime, held together by a colloid material. These are of renal origin, though they subsequently increase by the deposit of laminæ as they lie in the pelvis of the kidney or in the bladder. Those formed of triple phosphates are only thrown down when the urine becomes ammoniacal, and usually, therefore, originate in the bladder, though they are not confined to it. Nuclei of uric acid are most common in early childhood and in late adult life, especially if there is a tendency to gout. The starting-point is the deposit of crystals in the secreting tubules, and most likely in the actual cells; infarcts of uric acid are often present in the renal tubules of infants shortly after birth; and in gout all stages can be traced, from crystals to the cells and irregular masses in the tubules of the medullary part, to minute calculi projecting from the orifices on the pyramids or lying loose in the cavity of the pelvis. The cause of the precipitation is probably some impairment in power of the cells, whether this arises from weakness, from exhausting illness, or from long-continued overwork, as in gout; and it is assisted by everything that tends to check the flow of urine, whether it is the small size of the secreting passages, as in children, or an actual obstruction, such as an enlarged prostate. When once the pelvis of the kidney or the bladder is reached, the nucleus increases by acting as a focus around which are deposited layers that differ according to the reaction and composition of the urine.

Very little is known with regard to the formation of renal calculi, with the exception of those composed of triple phosphate, which may be formed around anything that causes decomposition of urea. In children of the poorer classes calculi are more common than among the well-to-do, and are nearly always composed of uric acid; possibly this arises from a deficient supply of milk and from improper diet. Gravel, too, is chiefly found among those who have a tendency to gout, or those who consume large quantities of animal food, or those who are addicted to the use of alcohol; but though this points in a general way to increase in the tissue waste, and to the effects of indigestion, acidity, and malassimilation, in causing the precipitation of sediments in the urine, something more is needed to explain the formation of calculi. There must be some condition of the urinary organs leading to the production of the colloid material necessary to cement the particles together.

Calculus is more common in the male than in the female; and this cannot be altogether explained by anatomy, as the same holds good with regard to the kidneys, although to a less extent. Hereditary influence probably does exist, even after full allowance has been made for the effects of locality and for similarity of habit.

Physical Characteristics.—Calculi vary in size from minute bodies, somewhat larger than gravel, to masses of more than a pound in weight. The smaller calculi are frequently numerous; the larger masses are single.

The following is a table of the characteristics of calculi (Moullin):

—	SHAPE AND SIZE.	SURFACE.	FRACTURE.	COLOR.	—
1. Uric acid....	Ovoid or round, varying in size from gravel to that of a hen's egg, or even larger.	Smooth or slightly granular. Susceptible of a fairly high polish.	Crystalline in proportion to purity. Brittle, but hard.	Yellow to red or reddish-brown.	Uric acid calculi are the most common of all, and are always deposited in acid urine. Usually they occur at the extremes of life.
2. Urates......	Ovoid, rarely as large as the former; often multiple.	Smooth and earthy.	Earthy and inclined to crumble. If it forms the whole, homogeneous; but in general much laminated.	Fawn colored or whitish-gray.	Most common in children, mixed with lime oxalate. Generally acid urate of soda, but sometimes of lime and ammonia.
3. Oxalates.....	Irregular, sometimes in the form of hemp-seed calculi.	Tuberculated....	Crystalline and very hard.	Dark brown, and even black, from repeated hemorrhages.	Usually layers of oxalate with others of uric or urates. Very often coated with phosphates.
4. Mixed phosphates.	Depend on that of nucleus.	Smooth and friable.	Chalky, soft, and breaking easily. Occasionally small crystals on the surface.	White or gray...	Only deposited after decomposition of the urea.
5. Phosphate of lime, or bone earth.	Rarely of any size....	Smooth and soft.	Breaking easily, with crumbling fracture.	White.	
6. Cystin.......	Ovoid and generally of medium size.	Finely granular, with small yellow crystals over it.	Soft and crystalline.	Yellow, turning pale green after exposure, with a somewhat radiated appearance. Waxy.	Usually pure, but sometimes on a uric acid nucleus.

Analysis.

INCINERATION.	MUREXID TEST.	FINAL TEST.	NATURE OF CALCULUS.
Melts and leaves a fixed residue.	Purple color...	Yellow flame when burned..........................	Sodium urate.
Melts and leaves a fixed residue.	Purple color...	Violet flame when burned..........................	Potassium urate.
Melts and leaves a fixed residue.	No purple color.	Dissolve residue in acetic acid: add ammonia in excess—white, crystalline precipitate.	Ammonio - magnesium phosphate.
Melts and leaves a fixed residue.	No purple color.	Residue insoluble in acetic acid. Dissolves in HCl; add ammonia—white precipitate.	Calcium phosphate.
Does not melt, but leaves a fixed residue.	Purple color...	Dissolve residue in dilute HCl; add ammonia until alkaline, then ammonium-carbonate solution.	
		(*a*) White precipitate	Calcium urate.
		(*b*) No precipitate................................	Magnesium urate.
Does not melt, but leaves a fixed residue.	No purple color.	Residue dissolved in water is not alkaline. Dissolves in HCl without effervescence. Ammonia in excess causes a white precipitate.	Calcium phosphate.
Does not melt, but leaves a fixed residue.	No purple color.	The calculus is insoluble in acetic acid, but the residue dissolves with effervescence.	Calcium oxalate.
		The calculus dissolves with effervescence in acetic acid..	Calcium carbonate.
No fixed residue...........	Purple color...	Mix powder with lime and moisten.	
		(1) Ammonia is evolved and red litmus paper becomes blue in the vapor.	Ammonium urate.
		(2) No ammonia..................................	Uric acid.
No fixed residue...........	No purple color.	Nitric acid solution grows yellow with evaporation. Residue insoluble in potassium carbonate.	Xanthin.
No fixed residue...........	No purple color.	Nitric acid solution turns dark brown. Residue soluble in ammonia.	Cystin.
No fixed residue...........	No purple color.	The soft calculus grows brown when dry and soft again with heat. Soluble in ether and residue grows violet on heating. Soluble in nitric acid, with slight bubbling; no change of color.	Urostealith.

See BLADDER (Stone), KIDNEY (Stone).

URINARY STREAM, ALTERATIONS. **Projective Force of the Stream.**—A strikingly strong stream is characteristic of a pathologically developed detrusor, due to hindrances to micturition in the urethral canal, such as follow moderate strictures, a narrow external orifice, or from spasm of the detrusor. A weakening of the projective force of the current is, at a certain age, pathognomonic of prostatic hypertrophy, and is seen in weakening of the detrusor from chronic inflammation of the mucous membrane and muscular tissue, from neglected gonorrhea, in atony from fatty degeneration of the muscular tissue, as in the course of acute infectious diseases, as typhoid fever or dysentery, and from voluntary retention of the urine when micturition is painful, as in stone in the bladder and fissures of the neck of the bladder. A decrease of force is observed in neurasthenics and in spinal diseases and tabes.

Decreased Caliber of the Stream.—Hypertrophy of the prostrate; or stricture, will diminish the caliber. In prostatics the current falls vertically, and in stricture as well; but in the former the force is not increased by pressing, while in the latter it is. Spasmodic contractions of the urethra, from general diseases, may also cause a diminution of the caliber.

Altered Form of the Stream.—A deviation from the round form is observed as the earliest sign of stricture. In decreased force of expulsion the form is changed. Change of form is not a certain sign of stricture.

Continuity of the Stream.—Sudden stopping of the stream is supposed to be pathognomonic of stone, but it is rarely observed except in children. If in adults, the stone must be very small and light. It is sometimes noticed in spasm of the sphincter in neurasthenics.

Starting the Stream, etc.—A drop-by-drop passage of the urine is characteristic of great stricture and great pressure. In some cases there follows a round and strong stream when it started drop by drop (spasm of sphincter).

Dripping of Urine.—Dripping of the urine after passage of the stream is a frequent occurrence, and is of varing importance according as it appears after voluntary urination—a short time after or in the intervals. It is due to a relaxation of the muscular tissue of the urethra, and the urethra lying in a half-opened condition does not press the urine out of the bulbous portions, so that it accumulates and is suddenly ejected after urinaton, or it drips away slowly during walking. Narrow strictures also cause it, when the portion posterior to the stricture fills like a sack, and unless emptied by milking movements by the patient, it drains away afterward. Abnormal narrowness of the orifice or very great phimosis are other causes. Involuntary urination may occur at any time, while dripping only follows urination.

URINE, EXAMINATION.—The principal duty of the kidney is to eliminate the waste products of the body arising from normal katabolism. To this end excrementitious material is constantly being absorbed from the fluids and tissues of the body, and the same is constantly thrown off through the medium of the kidneys, which have been accurately denominated the "sewers of the human system." By an examination of the urine, therefore, some idea of cellular activity may be formed, as well as of the character of such action as it occurs in the living organism.

Average Composition of Normal Human Urine (Wormley).

	(Parts in 1000.)		Voided Daily.	
			Grains.	*Grams.*
Water,	950.00			
Urea,	28.00	Organic matter 37.60	520.80	35.00
Uric acid,	0.60		11.16	0.75
Hippuric acid,	0.35		6.51	0.44
Creatinin,	0.65		12.09	0.81
Extractives,	8.00		148.80	10.00
Sodium chlorid,	8.00	Inorganic matter, 12.40	148.80	10.00
Phosphoric acid,	2.00		37.20	2.50
Sulphuric acid,	1.25		23.45	1.56
Lime, CaO,	0.25		4.65	0.31
Magnesia, MgO,	0.30		5.58	0.37
Potash, K_2O, and soda, Na_2O,	0.60		11.16	0.75
	1000.00		930.20	62.49

	(Parts in 1000.)	Voided Daily.	
		Grains.	*Grams.*
Water	950.00		
Organic matter	37.60	699.36	47.00
Inorganic matter	12.40	230.64	15.49
	1000.00		

To find the proportion of solids in the urine use Bird's formula: The last two figures of the specific gravity of urine nearly represent the number of grains of solids to the ounce contained in the urine. The same two figures multiplied by 2 (Trapp's factor) give the parts in 1000. Haeser's factor is 2.33.

Chemic Examination of Urine.

By the chemic examination of urine is ascertained the (1) quantity; (2) color; (3) odor; (4) reaction; (5) specific gravity; (6) freezing point. Also the presence or absence of (7) albumin; (8) glucose; (9) indican; (10) peptone; (11) propeptone; (12) acetone; (13) diacetic acid; (14) various coloring-matters, as bile; (15) the amount of urea; (16) various ingredients, as mucin, fibrin, inosite, sugar of milk, etc.; (17) urinary calculi.

Quantity.—The whole amount of urine passed within 24 hours must be collected. The normal quantity of urine passed within this time ranges from 40 to 50 ounces, or 1200 to 1500 c.c. The quantity is increased in winter and is less in summer, when there is more evaporation from the skin. The quantity is lessened in fevers and in exhaustive diseases.

CLINICAL SIGNIFICANCE OF VARIATIONS IN THE VOLUME OF THE TWENTY-FOUR HOURS URINE.—(*Bartley.*)

Increased Volume.	Polyuria ($V+$)	Renal affections.	Interstitial nephritis. Amyloid degeneration.
		Nutritive disorders.	Diabetes mellitus. Diabetes insipidus (phosphaturia).
		Nervous	Hysteria.
		Essential.	Epilepsy. Dementia.

Decreased Volume.	Oliguria. $(V-)$	In febrile diseases.	Dermatitis. Gout. Toxic conditions.
		In chronic affections.	Of the heart. Of respiratory organs Of the kidneys. Of the liver and uterus.
	Suppression, or anuria.	Calculus or tumor. Certain forms of nephritis. Nervous anuria. Traumatic anuria.	

Before beginning to collect the specimen of urine, the patient should first empty the bladder. Should any urine be lost at stool, it must be approximately estimated and included in the total quantity.

Color.—Normal urine is pale yellow. Dark amber urine frequently contains large quantities of uric acid.

The color may be changed to black by the administration of carbolic acid or naphthalin, or to yellow after the administration of santonin. In malarial fevers of a pernicious type it is frequently bright red from dissolved hemoglobin. The following is a table of colors of the urine:

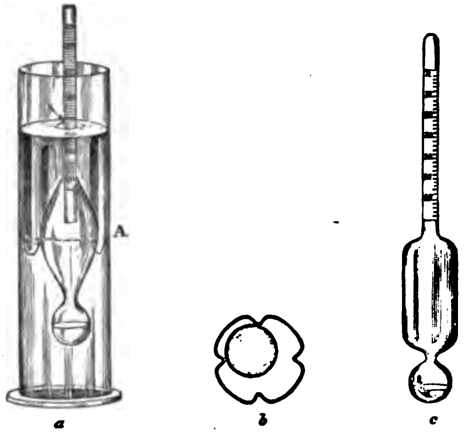
COLOR.	CAUSE OF THE COLOR.	PATHOLOGIC CONDITION OR CAUSE.
Nearly colorless.	Dilution or diminished pigments.	Various nervous conditions, hydruria, diabetes mellitus, diabetes insipidus, contracted kidney.
Normal color becoming black on standing.	Unknown; glycosuric acid.	Sometimes in pulmonary tuberculosis. Pathology unknown.
Milky...........	Fat globules; pus corpuscles.	Chyluria; fatty kidney; purulent disease in the urinary tract.
Dark amber to reddish-brown.	Increase of normal or occurrence of pathologic pigments; concentration of the urine.	Fever; pernicious anemia; excessive sweating.
Yellow.	Excreted drugs: *e. g.*, picric acid.	
Orange.	Excreted drugs: *e. g.*, santonin, chrysophanic acid.	
Brown to black.	Hematin, methemoglobin, melanin, hydrochinon, and catechol.	Small hemorrhages; methemoglobinuria; antipyrin; chlorate of potassium; melanotic sarcoma; carbolic acid; creosote.
Brownish-yellow to red, becoming blood-red on adding alkalies.	Substances introduced with senna, rhubarb, and chelidonium.	
Red or reddish.	Hemoglobin or free blood. Pigments in food: *e. g.*, logwood, madder, bilberries, fuchsin.	Hemoglobinuria or hematuria.
Greenish to brown or black.	Bile pigments.	Jaundice.
Dirty green or blue.	Dark serum on surface and blue deposit due to indigo-forming substances.	Cholera; typhus; hepatic and intestinal affections. Especially marked in stale urine.

Odor.—Faintly aromatic; rendered strong after eating certain vegetables, as asparagus.

Reaction.—Normally, the urine has an acid reaction, due chiefly to acid sodium phosphate. Uric, hippuric, and lactic acids also aid in rendering the urine of an acid reaction. In herbivora the urine is alkaline in reaction, and in carnivora very acid. A vegetable diet causes an alkaline urine. On standing, urine undergoes ammoniacal decomposition, rendering the reaction alkaline.

To determine its reaction, red and blue litmus papers are used; if the urine is acid, it turns blue litmus red; and if alkaline, it turns red litmus blue.

Specific Gravity.—The specific gravity of normal urine varies from 1015 to 1025. When the specific gravity is above 1030, glucose should be suspected; or when below 1010, albumin. However, the solids dissolved in the urine determine to a great extent its specific gravity, and a sample of urine may vary from 1015 to 1025 and contain albumin or glucose. For the determination of the specific gravity of urine the urinometer is generally used. In order to determine the accuracy of the instrument, it should be placed in distilled water at 60° F., when it should sink to the mark 0 or 1000.



a. SQUIBB'S URINOMETER AND JAR. *b.* SECTION OF SAME .

Freezing-point.—See CRYOSCOPY.

The following table from Bartley is of service:—

THE URINE OF THE TWENTY-FOUR HOURS—NORMAL AND PATHOLOGICAL.

PHYSICAL CHARACTER.	NORMAL.	ALTERATIONS IN ABNORMAL CONDITIONS.
Color..........	Pale straw to reddish yellow. The average color is amber.	Colorless: neuroses, chroni nephritis, diabetes. High-colored: acute fevers, icterus. Blood-red: blood or foreign color. Dark brown: hematuria, poisoning by carbolic acid, potassium chlorate, or iodoform. Smoky brown: presence of decomposed blood, acute nephritis. Yellow or green: presence of bile. White: chyle or pus.

PHYSICAL CHARACTER.	NORMAL	ALTERATIONS IN ABNORMAL CONDITIONS.
Transparency..	Clear, with only a slight flocculent cloud of mucus.	Urine turbid when passed, is abnormal. Whitish sediment may be pus, phosphates, or ammonium urate.
Consistence....	When normal, urine is mobile, like water.	When viscid, it indicates albumin, bile, mucus, or pus.
Odor..........	Peculiar to itself.	Urine putrid when passed, indicates cystitis.
Reaction......	Slightly acid; becomes more acid on standing, then becomes alkaline.	Urine strongly acid in fevers and inflammations of the liver, heart, and lungs; in acid dyspepsia Urine is alkaline in cystitis, and occasionally in debility, chlorosis, certain organic nervous diseases, typhus, etc.

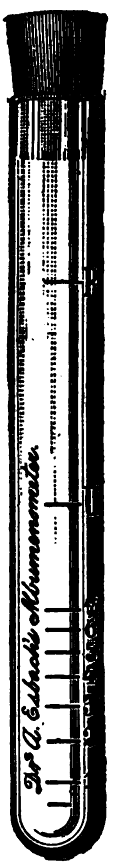
INORGANIC. CONSTITUENTS.	AMOUNT IN GRAINS.	ALTERATIONS IN PATHOLOGICAL CONDITIONS.
Sulphuric acid.	23 to 38	Having more or less the same source as urea, it will increase or diminish therewith. Occurs as sulphuric esters, and preformed.
Phosphoric acid.	46 to 54	Increased in fevers, in nerve-exhaustion, disease of spinal cord, and in tubercle of the lung. In phosphatic diabetes the alkaline phosphates are greatly increased. Diminished in many mental diseases, especially mania, in nephritis, and in chlorosis.
Oxalic acid....	0.3	Increased in catarrhal jaundice, and in oxalic acid diathesis, mental depression, and certain forms of dyspepsia.
Phosphate of lime.	4 to 5	Increased in osteomalacia, rickets, scrofula, carcinoma, long-continued suppuration, organic disease of the spinal cord. Diminished in fevers.
Phosphate of magnesium.	7 to 11	
Chloride of sodium.	150 to 250 Cl—90 to 150 Na—60 to 90	Increased in fevers at the onset, and with the reabsorption of dropsical fluids. Diminished during apyrexia, dropsies, cholera, typhus, inflammations generally, and especially in the forming stage of pneumonia.
Free acid (calculated as oxalic acid).	30 to 60	Increased during the acme of acute febrile affections (on account, probably, of the diminished proportion of water present). Diminished in most diseases affecting the nutrition and leading to a deficiency thereof.
Total inorganic salts.	200 to 380	
Potassium.	38 to 48	
Sodium.	140 to 180	
Calcium.	4 to 5	
Magnesium.	2 to 3	

ORGANIC CONSTITUENTS.	AMOUNT IN GRAINS.	ALTERATIONS IN PATHOLOGICAL CONDITIONS.
Urea..........	450 to 500 or 30 to 34 gm.	Increased after much meat, in fevers, diabetes mellitus, copious drinking of water or alcohol, congestion of liver. Diminished in abstinence from meat, rest, hepatic abscess, nephritis, chronic wasting diseases.
Uric acid......	4 to 15 (ratio to urea, 1 : 40)	Increased in leukocythemia, pernicious anemia, gout, rheumatism, deficient oxidation; organic diseases of heart, lungs, liver, or skin; after acute fevers and excessive meat diet. Diminished in vegetable diet, gout, before attack, chronic renal disease, outdoor exercise.
Hippuric acid..	5 to 15	Increased with vegetable diet, after taking benzoates. Decreased in animal diet.
Creatinin......	8 to 15	Increased in meat diet, and increased nitrogenous metabolism. Decreased in vegetable diet, and milk diet.
Xanthin Bases.	0.5 to 2	Increased in splenic disease, meat diet, deficient oxidation. Decreased in vegetable diet.
Carbolic acid, Cresol, etc.	0.015	Increased in certain diseases of the intestines, causing constipation (ileus, etc), but has been observed to be increased also in certain cases of diarrhea.
Indoxyl.......	0.07 to 0.05	Increased with diseases attended by constipation and intestinal fermentation, and occasionally, also, in cases of diarrhea. After cholera, cancer of the liver and stomach, purulent peritonitis. Valuable diagnostic sign in typhoid fever and cancer of the liver.
Acetone.......	Traces.........	Increased in diabetes mellitus; conditions of increased proteid metabolism, with deficient oxidation.
Diacetic acid,	Traces.	
Hydroxybutyric acid.	Traces.	
Albumin.......	None.........	Nephritis, pregnancy, poisoning by certain substances, cold baths, violent exercise, rheumatism, infection, fevers, etc.
Albumose......	None.........	Presence not clearly diagnostic.
Peptone	None.........	Presence not clearly diagnostic.
Dextrose......	None or trace.	Glycosuria and diabetes mellitus.
Lactose........	None.........	During lactation, after weaning.
Bile...........	None.........	Obstruction in bile-duct, structural hepatic diseases, malaria, pernicious anemia, yellow atrophy of liver, typhoid fever, and AsH_3 poisoning.
Blood.........	None.........	Hemorrhages, giving hematuria; hemoglobin in malaria, acute nephritis (sometimes).

ORGANIC CONSTITUENTS.	AMOUNT IN GRAINS.	ALTERATIONS IN PATHOLOGICAL CONDITIONS.
Pus	None	Suppuration.
Mucus	Present	Increased in any irritation along the urinary tract, by uric acid, calcium oxalate, etc., catarrh of bladder, urethra, vagina. Usually increased in acute fevers.

Albumin.—The urine should always be filtered before being tested.

Heller's Nitric Acid Test.—Place in a test-tube about 3 or 4 c.c. (45 to 60 minims) of pure nitric acid, and gently overlay with an equal amount of urine. If albumin is present, a cloudy ring of coagulated albumin will appear at the junction of the two liquids.



ESBACH'S ALBUMINOMETER.

Frequently there will appear an opaque zone immediately above the point of contact of the fluids, which is often due to urea nitrate or to urates. If the urine is heated, this zone will disappear if due to these latter substances; whereas if due to albumin, the precipitate remains permanent.

The Heat-and-acid Test.—In a test-tube place from 6 to 8 c.c. (90 to 120 minims) of urine, and boil. If albumin is present, a precipitate appears, insoluble in a few drops of nitric or acetic acid. Earthy phosphates are also precipitated from the urine by boiling, but these dissolve on the addition of nitric or acetic acid.

Picric Acid.—In a test-tube place from 4 to 5 c.c. of urine, and overlay with a saturated watery solution of picric acid; if albumin is present, a deposit, which is insoluble on boiling, forms at the line of junction.

Quantitative Determination of Albumin.—The albuminometer (a standard graduated glass tube) is filled with acidified urine to U, and the Esbach reagent added to R. This reagent consists of a solution of 10 grams of picric acid and 20 grams of citric acid in 1 liter of distilled water. After closing the tube with a rubber stopper it is inverted several times to mix the contents thoroughly and then placed for 24 hours in a test-tube rack. Then the amount of albumin is noted. The number of grams of albumin in a liter of urine is represented by the graduations on the tube.

Purdy's Centrifugal Method.—To 10 c.c. of the urine in a centrifuge tube 3 c.c. of a 10 percent solution of potassium ferrocyanid and 2 c.c. of 50 percent acetic acid are added. After inverting the tube to mix the contents thoroughly, the thumb being used as a stopper, it is allowed to stand for 10 minutes and then placed in a centrifuge the radius of which with tubes extended must be 6 3/4 inches. The revolutions of the tubes should be at the rate of 1500 per minute and should last 3 minutes. The amount of albumin is then read off in bulk percentage, 1 percent by bulk representing 0.021 percent by weight of albumin. Each division of the tube corresponds to 1 percent, 10 c.c. of urine being used and the divisions representing tenths of a cubic centimeter.

Clinical Significance.—It is stated by von Jaksch that the normal urine occasionally holds a variable quantity of albumin (serum-albumin globulin) as a temporary constituent, while at the same time the kidneys exhibit no alteration of structure; such is "cyclic albuminuria," which occurs during the day and disappears during the night. Many theories exist as to its exciting cause.

When albumin persists in the urine, it must be considered pathologic, and its presence in the urine is looked upon as being indicative of inflammation or degenerative changes in the structure of the kidneys; in other words, of nephritis. However, albuminuria is too often taken as an evidence of nephritis. Careful microscopic study of the urine, together with skilful clinical examination, are necessary to insure a correct diagnosis. Certain associated minor signs of nephritis often neglected are:

1. Auditory difficulties—ringing in the ears and deafness. Mounier has sought to bring the vertigo of Ménière's disease into this category.
2. Numbness of the fingers or hand.
3. Chilliness of legs and feet.
4. Pruritus, likened to the sensation produced by a hair on the skin.
5. Epistaxis, especially in the morning and beginning during sleep.
6. The sign of the temporal artery. The arterial system is tense, the vessels are bent and hard, without there being arteriosclerosis: and this is shown especially well by the temporal artery.

Each of these signs separately has little value; but collectively they are sometimes enough to form the diagnosis.

The following is a table of differential diagnosis between functional and organic kidney-disease (Lane):

FUNCTIONAL.	ORGANIC.
Albumin may be present at infrequent intervals, and may vary in amount from a plain trace to 10 to 20 grains in 24 hours.	Albumin is usually persistent, though not always abundant.
Albumin not found when patient is kept absolutely quiet, and rarely found in urine passed immediately on rising in the morning.	It may be intermittent and still be organic.

Functional.	Organic.
If dropsy is present, it is dependent on insufficient activity of the circulation, rather than on a tardy elimination of the fluids by the kidneys. A very careful examination of the heart and larger vessels is imperative.	Dropsy may or may not be present.
The quantity of urine passed in 24 hours (unless the use of mineral water, beer, etc., is frequently indulged in) will not vary greatly from 3 pints.	The quantity of urine for 24 hours is usually decreased, though in many cases it is greatly increased.
The day urine should exceed the night by double or more its bulk.	The night urine frequently equals and sometimes exceeds that of the day in bulk.
The specific gravity should be between 1015 and 1025, when taken from a sample of 24 hours' mixed urine.	The specific gravity (from a sample of 24 hours' mixed urine) is usually above 1020, though it rarely gets above 1030. In those cases where the quantity of urine is greatly increased, the specific gravity is correspondingly decreased, occasionally falling as low as 1005.
The urea is not diminished for 24 hours.	The urea is diminished for 24 hours.
There is no complication of acute diseases: viz., scarlatina, diphtheria, true gout, or retinal change.	There may be complicating diseases, as scarlatina, diphtheria, etc.
No pus or blood appears in the urine.	There may be both pus and blood in the urine.
No tube-casts are found.	Usually casts of urinary tubules are found.
Patient is under 40 years of age.	If patient is over 40 years of age, the prognosis must be particularly guarded.

Sugar (Glucose, Dextrose).—When the specific gravity of the urine is above 1030, it should be examined for glucose.

Moore's test with sodium or potassium hydroxid, Boettger's bismuth test, and Johnson's picric acid test are all subject to fallacious results.

Those tests which are recommended are Fehling's and Trommer's, which depend upon the reduction of cupric oxid, CuO_2, in alkaline solution by glucose to red cuprous oxid, Cu_2O (Fehling's and Trommer's) or to yellow cuprous hydroxid, $Cu_2(OH)_2$ (Trommer's). In these two tests albumin must first be removed.

Fehling's Qualitative Test.—Fehling's solution deteriorates with age, and it is therefore desirable to keep the copper solution and the alkaline solution separate.

The two solutions may be prepared and the test made in the following manner (Greene): **Solution A.**—Dissolve 34.64 grams of pure, dry, powdered copper sulphate in 200 c.c. of warm distilled water and add distilled water to make 500 c.c. of the *light blue solution.* **Solution B.**—Dissolve in 300 c.c. of hot water 180 grams of Rochelle salt. Filter. Add of pure caustic soda, 70 grams. Cool, and add distilled water enough to make 500 c.c. of a *colorless solution.* Keep in a dark place.

Pour into a test tube one finger's breadth of each of the stock solutions which when mixed should form a deep blue solution.

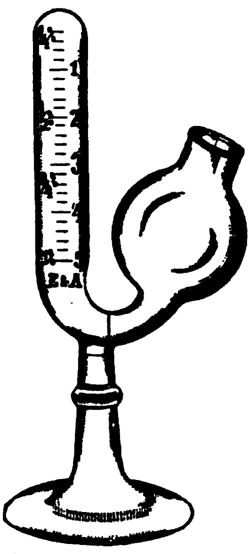
Heat test solution to boiling-point, add at once 20 to 30 drops of the suspected urine and *boil no longer*, but in the absence of a reaction set aside for from 5 to 30 minutes, and try the polariscopic and fermentation tests, a positive reaction *proves* nothing but the presence of a reducing agent unless the ultimate precipitate is *red*, not yellow or green.

Objections to Fehling's Solution.—Fehling's solution as ordinarily prepared is open to serious objections: (a) It is unstable. (b) An excess of glucose obscures the terminal reaction by becoming caramelised if boiling is prolonged. (c) It cannot be directly applied to ammoniacal urine unless such be especially prepared. (d) A large number of substances may reduce its cupric oxid. Such are glycuronic and glycosuric acid, alkapton creatinin, uric acid, and various drugs, such as benzoic acid, chloroform, chloral, glycerin, the salicylates, turpentine, etc. Hence, if one uses Fehling's solution for qualitative work, he must bear in mind that it is more valuable as a negative than as a positive test. *A urine that does not reduce Fehling's solution is free from glucose, but reduction does not conclusively establish its presence.*

Trommer's Qualitative Test.—To about 6 c.c. (1 1/2 drams) of the urine add about one-fourth its volume of sodium or potassium hydroxid solution. Then add, drop by drop, a solution of cupric sulphate (about 10 percent solution) and agitate the liquid until the bluish-white precipitate of cupric hydroxid, $Cu(OH)_2$, ceases to be dissolved and the liquid presents a slightly turbid or opaque appearance. Heat the liquid, and if glucose is present, the cupric oxid, CuO_2, will be reduced to red or brownish-red cuprous oxid, Cu_2O, or to yellow cuprous hydroxid, $Cu_2(OH)_2$.

Haines' Test.—A much simpler test is Haines' modification of Trommer's test. This test has the advantage of making use of a solution that remains stable almost indefinitely. This solution consists of pure copper sulphate, 30 grains, distilled water, 1 ounce; when a perfect solution is made pure glycerin, 1/2 ounce, is added; then after thorough mixing, 5 ounces of liquor potassæ are added. Of this solution 1 to 2 c.c. are gently boiled in a test-tube. Then 6 to 8 drops of the urine are added and the upper part of the solution is boiled gently for a second or two only. Presence of sugar is indicated by the formation of a yellow or yellowish-red precipitate.

Fermentation Test.—This test, which depends upon the production of carbon dioxide from glucose by the action of yeast, is best applied by means of an Einhorn fermentation tube so graduated that the amount of carbon dioxid is read off in terms of percent of glucose. The urine must therefore be diluted so as to contain less than 1 percent of glucose, the result being multiplied by the dilution. To the acidified urine is added a piece of compressed yeast the size of a pea and the mixture shaken and poured in the tube without introduction of air bubbles. Controls are also made. The tubes are placed over night in the incubator at 37° C. The percentage of sugar is then read off from the small figures the larger representing the cubic centimeters of gas.



Einhorn's Saccharometer.

The polariscope is also used to estimate the percentage of glucose in the urine.

Clinical Significance.—When found in the urine, glucose gives rise to what is called glycosuria, or diabetic urine. While it may be true that at times normal urine may contain a trace of glucose, yet from a clinical standpoint its occurrence and detection by the ordinary tests when accompanied by polyuria, should be looked upon as pathologic, and as indicative of diabetes. Glycosuria is also found in such conditions as cholera, intermittent fever, cerebrospinal meningitis, and in certain diseases of the heart, lungs, and liver, and especially in those diseases that have their seat in the fourth ventricle of the brain.

Indican.—Indoxyl potassium sulphate is an oxidation product of indol in the feces. Its method of formation is thought to be as follows: Indol in the intestines upon oxidation yields indoxyl, after which it combines in the liver with sulphuric acid and is eliminated as indoxyl potassium sulphate, or indican.

Test (Jaffe's).—To a small quantity of urine (4 c.c.) in a test-tube add an equal quantity of pure hydrochloric acid, and subsequently one drop of a saturated aqueous solution of sodium or calcium hypochlorite; agitate thoroughly; now add about one-fourth the volume of chloroform and shake; within a few moments the indican is decomposed into indigo-blue, which is dissolved out by the chloroform.

The hypochlorite solution may be easily prepared by adding 2 or 3 ounces of the commercial chlorid of lime to 8 ounces of water. It should be allowed to stand over a day or two, being shaken frequently, and, finally, filtered under a well-fitting cover. It should be freshly prepared every four weeks. The hypochlorite solution may also be composed of a saturated aqueous solution of sodium hypochlorite. Like the solution prepared from lime, it quickly deteriorates.

Clinical Significance.—At one time indican was thought to represent the amount of putrefaction occurring within the intestines, but this is not the case. In typhoid fever it is often absent. Some have thought that it is increased in wasting diseases and conditions in which the hydrochloric acid in the stomach is decreased, as in gastro-intestinal catarrh. It is said to be increased after a meat diet and in obstruction of the bowels, but this does not invariably hold true.

Peptone. Ralfe's Test.—Gently overlay 4 c.c. (1 dram) of Fehling's solution with a small bulk of urine. If peptone is present, a rose-colored halo will develop immediately *above* the zone of phosphates that frequently occurs at the point of contact of the two liquids.

Clinical Significance.—Peptone frequently occurs in typhoid fever, scarlet fever, miliary tuberculosis, scrofulous pneumonia, jaundice, and cancer of the liver.

Propeptone.—To a small quantity of urine in a test-tube add a few drops of nitric acid, which precipitates propeptones. Now heat, and the solution assumes a yellow color, which precipitates on cooling. It has the same clinical significance as peptone.

Acetone.—In normal urine traces of acetone are found that may be called physiologic.

Legal's Test.—To 3 or 4 c.c. (1 dram) of urine in a test-tube add enough solution of soda or potash to render it alkaline. To this solution then add a few drops of a freshly prepared saturated aqueous solution of sodium nitroprussid, and if acetone is present, a purple or violet-red color will be formed on the addition of chemically pure acetic acid. This test, however, is not distinctive for acetone as it is given by diacetic acid, alcohol and acetic aldehyd.

Trommer's Test.—To 10 c.c. urine strongly alkalinized with potassium hydrate 10 to 12 drops of a 10 percent solution of salicylaldehyd in absolute alcohol are added and the mixture is heated to about 70° C. If acetone is present the fluid changes color and becomes red upon standing. If absent, the color is unchanged. This last is very delicate and distinctive for acetone.

Clinical Significance.—In certain instances acetone precedes the occurrence of diacetic acid in cases of diabetes, and its presence is always considered an unfavorable symptom. It is also said to occur in the urine as the result of cancer and of cerebral disease. See Acetonuria.

Diacetic Acid.—To urine freshly voided add a few drops of a strong aqueous solution of chlorid of iron. If a precipitate occurs, the mixture should be filtered. Heat the filtrate to boiling, and to a small quantity again add the solution of ferric chlorid. If a red color is produced, add sulphuric acid and extract with ether by distillation.

Arnold's Test modified by Lipliawsky is more satisfactory than the above. Two reagents are used: (1) 1 gram of paraamidoacetophenon, 100 c.c. of distilled water, 2 c.c. concentrated hydrochloric acid; (2) 1 percent sodium nitrite solution. To 6 c.c. of solution 1 and 3 c.c. of solution 2 are added an equal volume of urine and 1 drop of ammonia. When shaken, the mixture becomes brick-red in color. Ten drops to 2 c.c. of this mixture, depending on the probable percentage of diacetic acid in the urine, are treated with 15 to 20 c.c. of concentrated hydrochloric acid, 3 c.c. chloroform and 2 to 3 drops of ferric chlorid solution. In the presence of diacetic acid the color of the chloroform changes to violet; if no trace is present the color is yellow or pale red. This test is very delicate and is not given by acetone in oxybutyric acid.

Clinical Significance.—Diacetic acid is never found in normal urine, and when it occurs in diabetes, the disease usually terminates fatally. In this condition it is spoken of as *diabetic diaceturia.* It may occur in certain febrile diseases, as typhoid fever, pneumonia, phthisis, pleurisy, and pericarditis, and in acute exanthematous diseases. See ACIDOSIS.

Coloring-matters (Bile). Gmelin's Test.—To a few drops of urine placed on a marble or porcelain slab add a few drops of impure nitric acid (or of nitric acid containing a few drops of nitrous acid), when a play of colors will be produced, such as green, violet, red, and yellow. The colors are best developed by placing the urine and acid a short distance apart and gradually bringing them together. This test may also be demonstrated in a test-tube by overlaying the acid with the urine.

Clinical Significance.—Biliary pigment is nearly always present in the urine in cases of cholelithiasis and in the acute stage of catarrhal jaundice.

Urea.—Different forms of ureameters are preferred by authors. However, the principle upon which the more reliable appliances are constructed depends upon the decomposition of the urea in the urine when brought into contact with a solution of sodium hypobromite or hypochlorite with the evolution of nitrogen.

Many forms of ureameters are too complicated, and cannot be used by the general practitioner. Simpler forms, while not so delicate, are more frequently employed, and only vary within a few grains of the correct amount of urea. Albumin should always be removed before estimating for urea.

Estimation of Urea by Doremus' Apparatus.—The sample of urine must be selected from the amount passed within 24 hours.

To employ this method the following solutions are required, and must be freshly prepared.

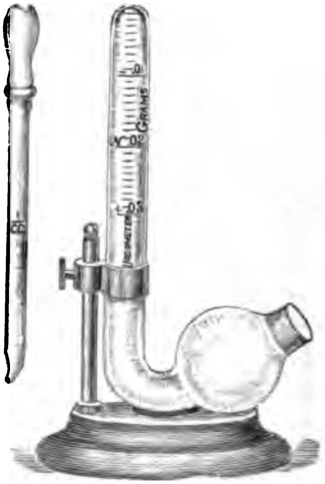
Alkaline Hypobromite Solution.

Dissolve 100 gm. of sodium hydrate in 250 c.c. of water and allow to cool.

Bromin Solution.

Bromin,	1 c.c.
Sodium hydrate solution (as above),	25 c.c.

Fill the upright graduated tube of the apparatus with the hypobromite solution as thus prepared to the mark .03, and add enough water to about half fill the bulb; mix thoroughly. Tilt the instrument forward, and by means of the pipet, pushed well into the head of the upright tube, slowly add 1 c.c. of urine. After about 15 or 20 minutes read off the volume of gas, which gives the percentage of urea in 1 c.c. of urine. To determine the total amount of urea, multiply this percentage by the number of cubic centimeters of urine passed within the 24 hours.



UREAMETER OF DOREMUS.

Frequently the percentage of urea is so great that the volume of nitrogen presses the hypobromite solution below the .03 mark. When this is the case, dilute the urine with an equal amount of water and proceed as before. Multiply the percentage obtained by 2, which gives the percentage of urea in the specimen of urine.

Clinical Significance.—The normal quantity of urea within the 24 hours fluctuates greatly. From 308 to 617 grains, or 1.5 to 2.5 percent, is the normal amount as stated by Tyson. In midwinter the urea may fall to 130 or 140 grains in those who lead sedentary lives. Urea is the chief organic constituent of the urine, and through its determination furnishes an index to the rapidity of metabolic changes taking place within the body. However, this change is not the only governing factor, since the quantity of urea depends also upon the amount of nitrogenous food ingested. The urea is *increased* (1) in diabetes mellitus; (2) by the use of nitrogenous foods; (3) after copious ingestion of water; (4) in acute febrile diseases; (5) in dyspepsia; (6) in nervousness. The urea is *decreased* (1) after prolonged rest; (2) by the use of vegetable foods; (3) by starvation; (4) by the excessive use of tea or coffee; (5) in nephritis. Muscular exercise has but little effect upon the excretion of urea.

Uric acid exists in the urine for the most part in the form of soluble urates of sodium, potassium, and ammonium.

Amount.—The amount of uric acid excreted daily by a healthy man ranges from 7 to 10 grains.

Uric acid is soluble with difficulty in water (in 18,000 parts of cold and 15,000 parts of hot water), and is insoluble in alcohol and ether.

In the urine it exists for the most part in the form of acid urates of sodium, and potassium.

It is frequently found as a sediment in urine, having the color of cayenne pepper granules.

Estimation of Uric Acid.—Probably the best and most accurate method for the estimation of uric acid by the general practitioner is that known as the Hopkins' method, which has been modified by Maisch as follows: To 100 c.c. (3 1/3 ounces) of urine add 30 gm. (1 ounce) of ammonium chlorid (or until saturated), and then add 5 c.c. (75 minims) of water of ammonia; allow the mixture to stand for from 15 minutes to half an hour and then filter. The flask in which the precipitation is to be carried out is thoroughly washed with a saturated aqueous solution of ammonium chlorid and poured upon the filter, and is subsequently washed several times with the saturated aqueous ammonium chlorid solution. The filter is then pushed through and the precipitate is transferred to a beaker (of 6 to 8 ounces capacity) with hot water by means of a Spritz bottle; to this fluid is then added 1 to 2 c.c. (15 to 30 minims) of pure hydrochloric acid, and the liquid is evaporated to 20 or 15 c.c. (1/2 of an ounce), when it is allowed to stand for 1 hour, or until cool.

The precipitated uric acid is then collected upon a filter-paper, washed several times with water, and finally the filter is punched through and the uric acid is transferred to a porcelain capsule or a watch-glass with alcohol by means of a Spritz bottle, dried, and after removal of the small particles of filter-paper that appear on the top of the precipitate, it is weighed. The product obtained is a reddish-brown amorphous powder which under the microscope is crystalline and light yellow or reddish-yellow in color.

Clinical Significance.—When uric acid is not eliminated by the kidneys, it becomes stored up in the body and gives rise to what is known as the uric or "lithic" acid diathesis. Owing to the fact of its insolubility, uric acid is supposed by some to be deposited in the tissues, such as the serous membranes, giving rise to joint pains. By others its failure of elimination is supposed to give rise to headache, hemicrania, neuralgia, despondency, lumbago, and rheumatism.

It is stated that uric acid and urea are eliminated in the urine in the relative proportion of 1 part of the former to 33 parts of the latter. This relation must, however, be accepted as subject to wide variations, depending upon such factors as the amount of exercise, the variety of food and drink, and the season of the year.

While it was formerly held that uric acid has its origin for the most part in nitrogenous elements taken as food, the more recent opinion is that it arises in the system from the disintegration of the leukocytes and nuclein.

Uric acid is *diminished* in diseases interfering with the process of elimination, such as nephritis, and in diabetes, in chronic rheumatism, before paroxysms of gout, and in chlorosis. It is *increased* in leukemia, in indigestion, after attacks of gout, in acute fevers, in functional diseases, and in heart- and lung-diseases in which there is much dyspnea. Physiologically, it may be said to be increased or diminished *pari passu* with urea.

Various Ingredients (Mucin, Fibrin), etc.—The importance of these ingredients in the urine has not been finally settled.

Ehrlich's Diazo Reaction.—See TYPHOID FEVER.

Microscopic Examination.

The miscroscopic examination of urine determines the presence or absence of (1) casts, (2) spermatozoa, (3) blood, (4) mucus or pus, (5) epithelium, (6) fungi, (7) uric acid, (8) urates of sodium and ammonium, (9) calcium oxalate, (10) calcium carbonate and sulphate, (11) triple phosphates, (12) leucin and tyrosin, (13) cystin.

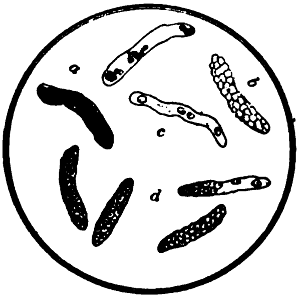
CENTRIFUGE.

To examine the urine microscopically the sediment is first obtained, either by means of the centrifuge or after the urine has stood for a period of from 12 to 24 hours. The urine may be preserved for a considerable length of time by the addition of a small quantity (from 5 grains to 1 dram) of chloral hydrate, or by adding 1 part of carbolic acid to 100 parts of urine or 1 part of mercuric chlorid to 3000 parts of urine.

Casts.—These bodies are molds of the uriniferous tubules, and are composed of the coagulable constituents of the blood that are pressed out of the blood-vessels into the tubules, and are afterwards excreted in the urine. This process forms the hyaline or granular cast. In some instances the cast also involves the epithelial cells of the tubule, which become detached, giving rise to an epithelial cast. Blood may also be entangled in the coagulable particles. Usually, this process is accompanied by the occurrence of albumin in the urine, but casts may be present in urine without albuminuria.

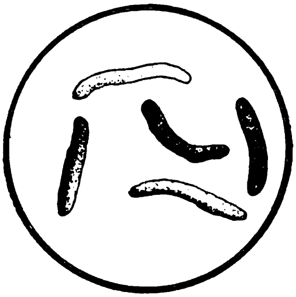
Tube casts vary in size, shape, and appearance. Their length ranges up to 200μ or more; their diameter from 4μ to 40μ. They are usually straight, but may be curved, twisted, convoluted, or branched.

Varieties.—*Blood casts* are those composed of coagulated blood with corpuscles embedded. They show that the hematuria originates in the secreting structure of the kidney.



a. Blood cast and hyaline cast carrying blood-cells. *b.* Leukocyte or pus-cast. *c.* Hyaline cast carrying renal cells *d.* Epithelial casts.—(*Greene.*)

Epithelial casts are those composed of plastic matter with cells embedded and denoting desquamative inflammation.



Granular casts light and dark, coarse and finely granular. (*Greene.*)

Fatty casts are those containing free fat globules in the coagulated matter, indicating fatty degeneration in a chronic nephritis.

Granular casts are those containing finely divided, granular debris, either in scattered masses or completely filling the casts. They are usually found in cases of contracted kidney.

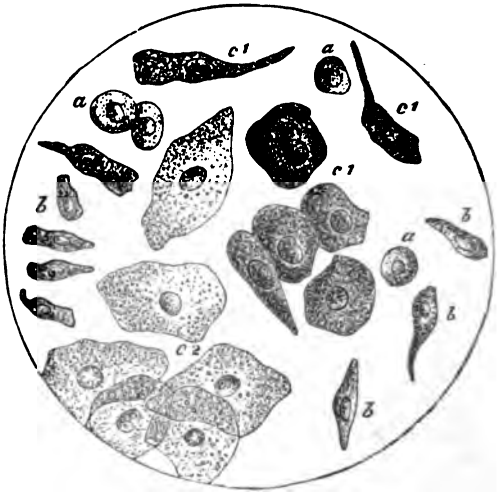
a. Waxy casts. *b.* Fatty or fat-bearing casts.—(*Greene.*)

Hyaline casts are transparent, soft, delicate casts, also called *mucous casts.*

Pus casts are those that contain degenerated leukocytes; indicative of involvement of the interstitial kidney substance.

Seminal casts are molds of the seminal tubules found in the urine, and are recognized by the presence of spermatozoids.

Waxy casts are those that give the amyloid reaction; they are large and yellowish in appearance, and are indicative of serious nephritis.



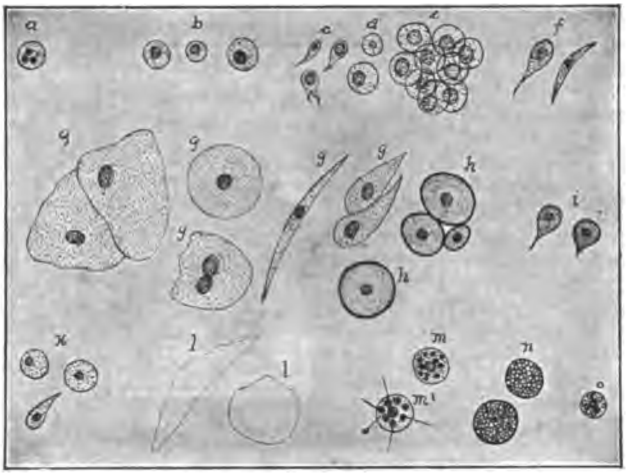
a, a, a. Round epithelium from bladder. *b, b, b, b.* Columnar epithelium from ureters and urethra. c^1, c^1, c^1. Columnar and squamous epithelium from deeper layers of epithelium of bladder. c^2. Squamous epithelium from superficial layers of epithelium of vagina.—(*Tyson.*)

Clinical Significance of the Different Varieties of Casts.

ACUTE PARENCHYMATOUS NEPHRITIS.	CHRONIC PARENCHYMATOUS NEPHRITIS.	CHRONIC INTERSTITIAL NEPHRITIS.
Only a few casts present. Blood casts, epithelial casts, leukocytes.	Many casts seen. In *early* stages large hyaline and dark granular casts. In *later* stages epithelial, large and small granular casts, hyaline casts, and compound granular cells.	Few casts present. Large and small hyaline casts, waxy casts, fatty casts, oil droplets.
During convalescence fatty casts may be present.	In acute exacerbations, on account of the inflammatory processes, there may be present epithelial casts and many leukocytes.	In acute exacerbations on account of the inflammatory process, there may be present all varieties of casts, especially large and small granular casts.

During most acute fevers hyaline casts are found. Cylindroids have no clinical significance.

Epithelium.—When the renal epithelium is found in the urine, it generally denotes a grave form of kidney-disease. It may be recognized by the large, oval nuclei. An excessive amount



Epithelium from Different Areas of the Urinary Tract.
a. Leukocyte (for comparison). *b.* Renal cells. *c.* Superficial pelvic cells. *d.* Deep pelvic cells. *e.* Cells from calices. *f.* Cells from ureter. *g, g, g, g, g.* Squamous epithelium from the bladder. *h, h.* Neck-of-bladder cells. *i.* Epithelium from prostatic urethra. *k.* Urethral cells. *l, l.* Scaly epithelium. *m, m'.* Cells from seminal passages. *n.* Compound granule cells. *o.* Fatty renal cell.—(*Ogden.*)

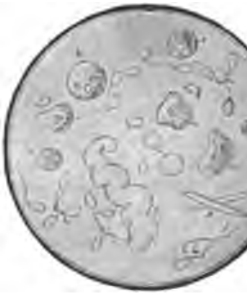
of epithelial cells from the bladder, in combination with pus, denotes cystitis. See also HEMATURIA.

Bacteria are frequently found in the urine.

Tuberculosis of the urinary tract is often diagnosticated by discovery of the tubercle bacilli in the urine. To examine the urine for *tubercle bacilli*, the sediment must be thoroughly centrifuged, and then examined in the same way that sputum is (see TUBERCULOSIS); but a small amount of egg albumin is added to the specimen before it is placed on the slide or coverslip.

Tubercle Bacilli in Urine. (*Greene.*)
Observe tendency to form groups.

Yeast fungi are found in nearly all specimens of urine after they have been exposed to the air.



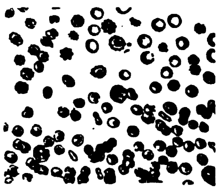
Spermatozoa and Associated Substances in Urinary Deposits.
a,a,a,a. Spermatozoa. *c,c.* Spermatozoa, tail out of focus. *d,d,d.* Amyloid corpuscles. *e.* Prostatic cast. *g.* Crystals. *h.* Lecithin-granule cells. *k,k,k.* Epithelium.—(*Greene.*)

Spermatozoa may be found in the urine. See SEMEN.

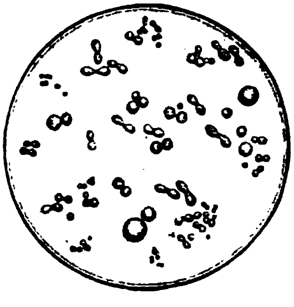
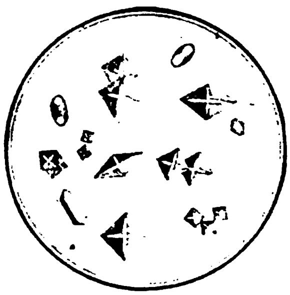
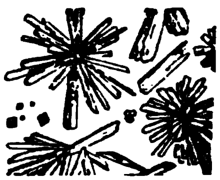
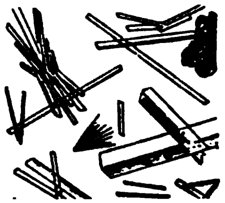
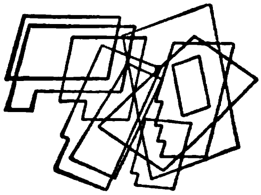
Calculi.—See URINARY CALCULI.

Urinary Sediments.—See the following table.

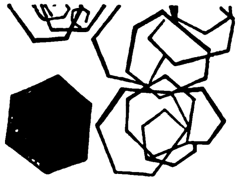
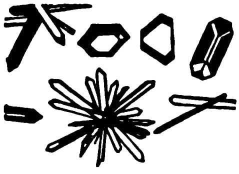
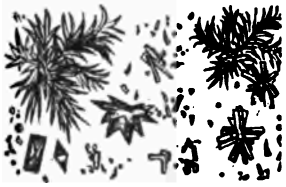
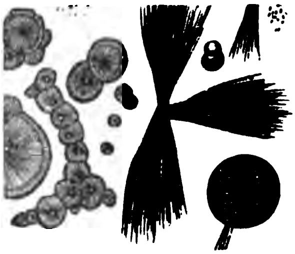
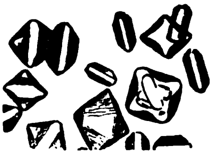
URINARY SEDIMENTS, TABLE OF.

Variety.	Gross Appearances and Characters.	Microscopic Features.	Tests.	Significance.	Illustrations. (*After Tyson, Greene, Casselman Landois, Beale, Jakob and von Jaksch.*)
Blood..........	A flocculent, red deposit.	Blood-corpuscles.	Equal parts of tincture guaiac and mature oil turpentine or ozonic ether cause green line at junction with urine.	Disease of kidney, bladder, or urethra.	

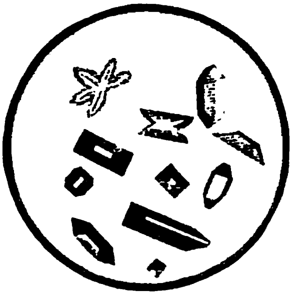
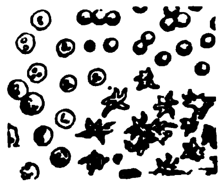
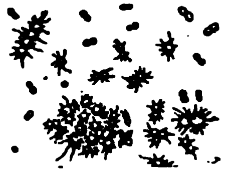
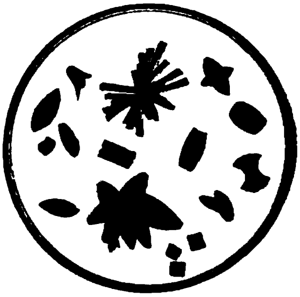
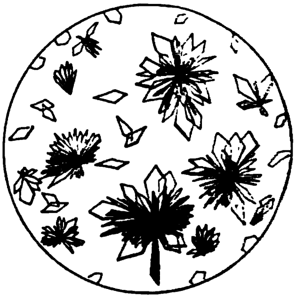
URINARY SEDIMENTS, TABLE OF.

Variety.	Gross Appearances and Characters.	Microscopic Features.	Tests.	Significance.	Illustrations. (*After Tyson, Greene, Casselman, Landois, Beale, and von Jaksch.*)
Calcium carbonate.	Whitish sediment (rare); urine alkaline.	Amorphous granules; small spheric or dumb-bell crystals.	Soluble in acids with effervescence.	No special significance.	
Calcium oxalate.	Cloudy, whitish, often highly refracting sediment.	Transparent, refracting octahedra. Sometimes "dumb-bell" shaped.	Soluble in mineral acids, not in acetic.	Vegetable diet, especially rhubarb; oxaluria; often with uric acid in lithemia.	
Calcium phosphate.	Whitish or yellowish sediment; urine feebly acid or alkaline.	Amorphous granules, or wedge-shaped crystals, separate or in rosset-like clusters.	Insoluble by heat; soluble in acetic or mineral acids.	Phosphaturia; dyspepsia; alkaline fermentation.	
Calcium sulphate.	Not distinctive; rare; urine acid.	Elongated, transparent needles or tablets.	Insoluble in ammonia or acids.	No special significance.	
Cholesterin	Not distinctive; very rare; urine alkaline.	Large, transparent plates, often superimposed; one corner frequently defective.	The microscopic appearances.	Pyelitis, cystitis, etc.	

URINARY SEDIMENTS, TABLE OF.

Variety.	Gross Appearances and Characters.	Microscopic Features.	Tests.	Significance.	Illustrations. (*After Tyson, Greene, Casselman, Landois, Hawk, Beale, and von Jaksch.*)
Cystin	White or yellowish - gray deposit; rare; acid, neutral, or alkaline urine.	Six-sided plates, often superimposed.	Crystals burn on platinum with a bluish-green flame without melting; if heated with caustic potash on silver plate leave a permanent, dark stain.	Cystinuria may be an hereditary and insignificant condition; or it may indicate the presence of a cystin stone in the kidney.	
Hippuric acid	Not distinctive; whitish deposit; urine acid.	Four-sided prisms, with two or four beveled edges at the ends.	Dissolved in ammonia, but not in hydrochloric acid	Diet of cranberries and other vegetables; administration of benzoic acid; in diabetes.	
Indigo	Amorphous fragments or concretions of blue color; urine alkaline or acid.	Amorphous granules, fine needles and crystals of of a blue color.	The color is distinctive.	In decomposing urine.	
Leucin and tyrosin.	Usually a bile-stained deposit; often scanty; rare; urine acid.	*Leucin:* Yellowish highly refracting spheres, containing radiating lines. *Tyrosin:* "Needles" arranged in "sheafs."	*Leucin:* Heating with protonitrate of mercury in solution deposits metallic mercury. *Tyrosin:* Crystals dissolved in hot water, and treated with mercuric nitrate and nitrate of potassium, giving a red solution and red precipitate.	Destruction of liver; especially acute yellow atrophy, and phosphorus-poisoning.	
Magnesium phosphate.	Not distinctive; rare; urine concentrated, but feebly acid or alkaline.	Large, strongly refracting plates, in the shape of elongated rhombic tablets.	Soluble in acetic acid, re-precipitated by carbonate of sodium.	No special significance.	
Mucin	Cloudy turbidity or a viscid, gelatinous sediment.	Epithelium and leukocytes, held in a stringy, transparent mass.	Acetic acid causes cloudiness or precipitate.	Genito-urinary catarrh, especially cystitis.	

URINARY SEDIMENTS, TABLE OF.

VARIETY.	GROSS APPEARANCES AND CHARACTERS.	MICROSCOPIC FEATURES.	TESTS.	SIGNIFICANCE.	ILLUSTRATIONS. (*After Tyson, Greene, Casselman, Landois, Hawk, Beale, and von Jaksch.*)
Phosphates, Triple—Ammonio-magnesium phosphate.	Heavy, white deposit; urine feebly acid or alkaline.	Triangular prisms with beveled edges—"coffin lids." Also feathery, star shapes, and other forms.	Insoluble by heat. Soluble in acetic or mineral acids.	Dyspepsia; alkaline fermentation of urine; cystitis.	
Pus...........	Compact, thick, viscid sediment; urine acid or alkaline.	Degenerated leukocytes.	The dark-red color of pus-corpuscles on adding iodo-potassic-iodid solution.	In acid urine, with uric acid and no mucus; pyelitis; or alkaline urine with triple phosphates; cystitis.	
Tyrosin........	See *Leucin.*				
Urates of sodium, ammonium, and potassium. (*The illustration is of ammonium urate.*)	"Brick-dust" deposit, the color due to the color of the urine. Dissolved and cleared by heating. Urine acid; sometimes alkaline.	Amorphous granules. Ammonium urate appears as spheric crystals surrounded by spicules—"hedge-hog crystals."	Dissolved by heat or on adding acids.	Lithemic and rheumatic diathesis. Fever. Ammonium urate occurs when an acid urine is undergoing alkaline fermentation.	
Uric acid.......	Small grains, resembling red pepper; urine acid.	Crystals of various shapes colored brownish-red by the urinary pigments. The commonest form resembles a whetstone.	The crystals dissolve in caustic potash. The murexid-test produces a purple color.	Lithemic or rheumatic diathesis.	
Xanthin.......	Not distinctive; urine acid; very rare	"Whetstone" crystals.	Insoluble in acetic acid; soluble in ammonia.	Xanthin-stone in the kidney.	

URINE, EXTRAVASATION.—Extravasation of urine is commonly, though not always, the result of stricture, and is then due either to the dilated urethra behind a stricture ulcerating and giving way, or to a lacunar abscess bursting into the urethra. In either case the urine is forced by the contraction of the bladder into the surrounding cellular tissue.

The urethra may give way (1) in front of the anterior layer, (2) between the two layers, or (3) behind the posterior layer of the triangular ligament. In the first and by far the most common situation it is the bulbous portion of the urethra that gives way. Here the urine is prevented from passing (1) backward into the pelvis by the anterior layer of the triangular ligament which is attached to the rami of the pubes and ischium and to the subpubic ligament; (2) downward into the ischiorectal fossa by the anterior layer of the triangular ligament continuous around the transverse perineal muscle with the deep layer of the superficial fascia of the perineum; (3) laterally, on to the thighs, by the deep layer of the superficial fascia of the perineum attached to the rami of the pubes and ischium. Hence it passes in the middle line into the cellular tissue of the scrotum and penis, and laterally on to the abdomen, where it is prevented from passing down the thigh by the deep layer of the superficial fascia of the groin (which is continuous with the deep layer of the superficial fascia of the perineum) which is attached along the line of Poupart's ligament.

When the membranous portion of the urethra is ruptured, the urine is confined at first between the two layers of the triangular ligament, and if not released, will make its way (1) forward, through the anterior layer, and take the course given; or, rarely, (2) backward, through the posterior layer, and then, as when the urethra gives way behind the posterior layer, will make its way around the neck of the bladder, and finally induce a fatal result. Wherever the urine spreads it causes inflammation and sloughing.

Symptoms.—The history of a case of extravasation is not uncommonly as follows: A patient with a tight stricture is straining to pass water; he feels something give way, experiences a sensation of relief, and perhaps owing to the tension being removed by urine being forced into the cellular tissue, the superadded spasm for a time ceases, and a few ounces of urine are passed through the urethra. In half an hour or so a pricking or burning sensation is felt in the perineum, soon followed by pain, and by rapidly increasing swelling of the perineum, scrotum, and penis. If the urine is not let out by timely incisions, the swellng extends to the groin, and in some cases has been known to reach as high as the axilla. The skin now appears dusky or purplish-red and edematous, and gangrene and sloughing of the infiltrated tissues rapidly ensue. The absorption of the septic products gives rise to constitutional disturbance and to fever, which, though it may at first run high, soon assumes a low typhoid character, and the patient, especially if the subject of chronic kidney-disease, frequently sinks into a comatose state and dies. When the extravasation occurs between the two layers of the triangular ligament, it may remain localized, giving rise to a hard, circumscribed swelling in the perineum, which may slowly make its way toward the scrotum; and, lastly, when the extravasation occurs behind the posterior layer of the triangular ligament, and the urine is extravasated into the pelvic cellular tissue, the symptoms resemble those of extraperitoneal rupture of the bladder (Walsham).

Treatment.—A catheter should be passed into the bladder, or, when this is impossible, down to the stricture, and in either case a free incision, extending into the urethra, should be made on the catheter, in the middle line of the perineum. Free incisions through the skin of the scrotum, penis, and groins—in fact, wherever the urine has penetrated—should likewise be made, to allow of its draining away, and the wounds should be rendered as far as possible aseptic by the free application of iodoform or other antiseptics. At the same time the patient's strength must be supported by fluid nourishment and stimulants; opium should be given, unless contraindicated on account of kidney-disease.

URINE, INCONTINENCE (Enuresis).—Nocturnal enuresis may occur in adults or in children. It is more common in boys than in girls. It rarely persists beyond puberty; if so, it is usually incurable; such cases are most often met with in girls. Urination may occur once or several times during the night—most often during the first sound sleep—and again in the early morning.

During the first months of life the urine is retained in the bladder for only a short time, but after the first year constant or very frequent micturition indicates some abnormality or disease, although it may be due to mere habit. Paralysis; malformation; the secretion of a large amount of urine, as in diabetes insipidus; hyperacid urine; calculus; cystitis; irritation of the penis, from adhesions to the glans penis, etc.; a tight prepuce or contracted meatus; worms or other rectal irritation; unduly profound sleep, from the semi-asphyxiated condition caused by enlarged tonsils or postnasal adenoids; dreams or gastric disturbance, from late or unwholesome meals, and masturbation—these are all causes. Ill health, conjoined with an unstable and easily excited mind, may give rise to enuresis. The condition has been known to subside in delicate children on the correction of eye-strain. Renal calculus or pyelitis of tubercular origin may be possible causes.

In adults enuresis may arise from an overdistended bladder, from which urine continually dribbles. This is nearly always the result of impacted urethral calculus, phimosis, hypertrophied prostate, paralysis, or stricture. The use of a filiform bougie or a very finely calibered catheter on the first attempt to withdraw the urine will differentiate from incontinence, while the associated paralysis, if any, will confirm the diagnosis.

Incontinence of urine in women may occur from injury to the neck of the bladder or to the urethra, from the prolonged pressure of the child's head during labor, or from instruments, or the removal of stone. It may be nocturnal or daily.

Treatment.—In the treatment of nocturnal incontinence of urine, apart from paralysis and irremediable malformations, the cause is to be looked for and all sources of irritation are to be removed. If due to phimosis, circumcision should be done; if to adhesions, these must be broken down; if the meatus is too small, dilatation or meatotomy should be performed. The urine should be examined for overacidity and for evidence of cystitis, and these conditions should be corrected by the use of potassium citrate or of liquor potassæ. If the diet is at fault, it should be corrected and irritating food should be forbidden. Worms must be removed by appropriate treatment. Late or undigestible meals are to be forbidden, and the habit of sleeping on the back is to be avoided. Too great weight of bedclothes is often provocative, and is to be remedied.

The most serviceable drug, after alkaline diuretics, is belladonna, or its alkaloid, atropin. Belladonna should be given in full and increasing doses (from 5 to 10 drops of the tincture 3 times daily, increase to from 10 to 20 drops in 12 hours) until physiologic results are obtained. Atropin is sometimes effective when belladonna fails. Potassium bromid may be given alone or with belladonna, while ergot, cantharides, potassium nitrate, camphor, and other drugs have been employed. In the incontinence of adults resulting from sudden movement or from excessive laughter, drop doses of the tincture of cantharides, 3 times daily, will do much to effect a cure, alkaline diuretics being employed at the same time. Punishment, by severe scoldings or whippings, is useless, and makes the sufferer sullen, and probably augments the trouble. If enuresis results from habit, it may be necessary to administer diuretic waters for a long time. The habit of passing urine just before retiring, and of arising for the same purpose several times during the night, should be encouraged.

The following prescriptions are useful:

℞.	Potassium citrate,	℥ ss
	Spirit of nitrous ether,	ʒ vj
	Water, enough to make	℥ j.

Give a dessertspoonful every 4 hours in an equal quantity of water.

℞.	Arsenic trioxid,	gr. 1/3
	Extract of nux vomica,	gr. ij.

Make into 20 pills. Give 1 pill 3 times daily after meals to a child of 8 or 10 years.

When enuresis results from paralysis or from retention and distention of the bladder, the catheter is to be used. Asepsis must be strictly maintained, and the bladder washed out with a weak antiseptic fluid, such as boric acid solution or a solution of 1:10,000 of bichlorid of mercury, or of 1:100 of phenol, when paralysis is responsible for the condition. In some incurable cases a urinal must be worn.

URINE, RETENTION.—Retention of urine is either partial or complete. In the former condition a certain amount of urine is never expelled, and the capacity of the bladder is proportionately diminished; in the latter it is distended until it can hold no more.

Etiology.—Either the expulsive power of the bladder is defective or there is some obstruction to the exit of the urine; or both may happen.

1. The former may arise from failure of the muscular power or of the nervous stimuli, or of both. Atony and peritonitis, spreading to the muscular coat, are instances of the first named cause; paralysis from disease or injury of the spinal cord or of the sacral nerves, hysteria, exhaustion (as in fevers), alcoholic excesses, shock, and, perhaps, belladonna poisoning, of the second. Railway accidents, operations around the rectum, such as ligation of piles, and injuries in the region of the pelvis are especially likely to cause it; but in old people, and in those in whom the wall of the bladder is already in a condition of partial atony, retention may follow the slightest accident, even a fall on the trochanter or the passage of a catheter.

2. Obstruction to the flow of urine may be situated:

(*a*) In the interior of the canal: impacted calculus, for example.

(*b*) Outside the urethra: such as a string tied around the penis by a child to check nocturnal incontinence or the pressure of a gravid or displaced uterus.

(*c*) In the wall itself. This is by far the most common. The affection may be permanent, as stricture or enlarged prostate; or temporary, as congestion and spasm. In most cases temporary and permanent causes act together. An impacted calculus, for instance, may occupy only a small part of the interior, but the spasmodic contraction that it causes prevents the passage of a drop of urine; a stricture which admits a No. 7 or No. 9 French catheter may suddenly become closed in the same way, owing to alcoholic excesses or to exposure to cold; an enlarged prostate may have existed for years without serious inconvenience, until suddenly congestion sets in, and the mucous membrane becomes so swollen that the weakened muscular fiber gives way.

Symptoms.—When retention has come on slowly, as from the gradual contraction of an organic stricture, there may be but little local pain and no constitutional disturbance, even though the bladder may be distended by many ounces of urine. When, however, it is produced suddenly, there is usually great pain, followed by severe constitutional symptoms—a small and frequent pulse, a dry and brown tongue, and perhaps delirium, symptoms probably due to the sudden check to secretion by the kidneys and to the stretching of the bladder. The bladder itself, unless greatly hypertrophied and contracted, rises out of the pelvis, and may be felt as a distinct tumor, dull to percussion, and at times extending as high as the umbilicus, or, in extreme cases, even to the ensiform cartilage. The patient, unless drunk, usually complains of inability to pass urine. When, however, the bladder has become gradually distended and urine is passively flowing away, he may complain of inability to hold his urine, and be quite unaware that the bladder is full, and may object to having a catheter passed until the condition has been explained. The presence of a swelling in the abdomen, and the flowing of urine through the catheter immediately after the patient has passed urine and believes that he has emptied his bladder, should serve for the diagnosis. In suppression of urine the bladder is found empty on passing a catheter.

Results of Retention.—If the bladder is soon relieved, no apparent harm may ensue. If neglected, however, the overdistention may lead to (1) atony of the muscular coat; (2) cystitis; (3) nephritis; (4) rupture of the urethra behind the obstruction; (5) rupture of the bladder itself (rarely); and (6) passive overflow of urine, the bladder remaining full.

Treatment.—The distended bladder must be relieved, and if the distention is extreme and the symptoms urgent, at once.

As a rule, the patient is to be kept warm and should lie on his back. The administration of a hot bath and an opiate, or of a few drops of chloroform, may suffice, but usually resort must be had to instrumental aid. If success at passing an instrument into the bladder is not shortly obtained, it may be necessary to administer an anesthetic. In hysteric retention in women judicious indifference is best. After a safe interval the bladder should be relieved by the passage of a soft-rubber or gum catheter and withdrawing the urine. A hot hip-bath or cold water thrown suddenly over the back will often produce the desired effect.

In cases of retention of urine in young children an enema thrown into the rectum will often so stimulate both the center for defecation and the genitospinal center for urination as to bring about micturition without catheterism—a proceeding always dangerous in young children, unless they have been anesthetized. When retention is due to cyst of the sinus pocularis the passage of an instrument will rupture the cyst and the infant will be relieved.

When the cause of the retention is a stricture, it is well to try to pass first a soft catheter, then a hard catheter, employing large sizes at first, although some surgeons advise the immediate use of the filiform bougie. It is advantageous to withdraw but half of the retained urine, withdrawing the remainder after waiting half an hour, and then washing out the bladder with hot boric acid solution. After withdrawal of the urine hot blankets should be wrapped around the patient, and a hot sand-bag may be placed against the perineum and a hot water-bag over the hypogastrium. A suppository of opium and belladonna and tablets of salol and boric acid may be employed for several days subsequently.

If failure ensues from the use of rubber or silk or hard catheters, filiform bougies are to be employed. This form of bougie acts as a capillary drain, and will empty the bladder in a few hours. It is, of course, to be allowed to remain in the bladder until this is accomplished. Successively larger bougies are to be inserted alongside of the filiform for several days. No attempt is to be made to dilate the stricture forcibly until retention has ceased and inflammation has subsided.

Aspiration and suprapubic or perineal cystotomy must be resorted to when other means have failed. See URETHRA (Stricture).

In simple inflammation of the urethra the hot hip-bath, the use of suppositories of opium and belladonna, and the application of the hot sand-bag to the perineum and of the hot water-bag over the hypogastrium are means usually employed with success. A soft catheter is to be used if these measures fail, or if the symptoms are very urgent.

In spasmodic stricture a metal catheter of good size should be held firmly against the spasmodic area a sufficient length of time to cause the stricture to relax.

The occluded meatus of a new-born child may be incised with a tenotome or may be dilated. In complete phimosis the prepuce is to be slit up. A urethral stone may be removed by the urethral forceps or may be pushed in or out. When fecal impaction causes retention, the feces must be removed by enema, by the hand, or with a scoop. When prostatic hypertrophy is causative, a filiform bougie is first passed, and over a catheter. A silver instrument with a large curve is sometimes employed. A soft catheter is to be employed when expulsive defect exists. See PROSTATE (Diseases).

The administration of laxatives, maintenance of the free action of the skin, warmth, and confinement to bed are general means of treatment commonly employed, while the use of such drugs as salol, boric acid, and quinin is advised to render the urine antiseptic. It is, of course, understood that asepsis and antisepsis are important in the use of instruments.

Aspiration is to be employed, under antiseptic precautions, when other means fail. The trocar or aspirator needle should be passed in the median line just over the pubes, its course being downward and backward. The puncture must be antiseptically dressed: *e. g.*, with iodoform and collodion. See BLADDER (Paracentesis).

When rupture of the urethra has taken place and retention of urine ensues, perineal incision is advised, but otherwise it is not now resorted to. It must always be borne in mind that the horizontal position is to be maintained when passing the catheter, as this position lessens shock. See URETHRA (Injuries) URINE (Extravasation), URINE (Suppression).

URINE, SUPPRESSION.—Suppression of urine is the term applied to the nonsecretion of urine by the kidneys, and it must not be confounded with retention of urine, in which the urine is secreted as usual, but its passage from the bladder is obstructed. In the former condition the bladder is empty; in the latter, distended. Suppression of urine may be due to obstruction of the ureter by a calculus, acute nephritis, or sudden shock. The usual causes of such shock are genitourinary operations. Suppression of urine is also caused by acute poisoning by phosphorus, lead, turpentine, cantharides, etc. It is seen in the collapse stages of cholera and yellow fever and in hysteria. If suppression of urine is not relieved, coma, convulsions, and death from uremia quickly ensue.

Treatment.—Dry or wet cupping of the loins, hot vapor baths, free purging, as by elaterium or croton oil, the administration of diuretics, injections of pilocarpin, and hot enemata by the rectum are, at times, successful in relieving the congested kidney. Large, hot irrigations of normal salt solution, with the double current rectal tubes, or infusion of saline fluids in the tissues or veins, may be tried. See NEPHRITIS, URINE (Retention).

UROTROPIN (**Hexamethylenamin**). $C_6H_{12}N_4$.—A compound produced by the action of formaldehyd on ammonia. The drug has other trade names—cystogen, aminoform, formin, uritone. Urotropin increases the excretion of the urine and of uric acid, the solution of the urates beginning within 24 hours. Urotropin is decomposed in the organism, formaldehyd being set free and being eliminated in the urine. Ordinary medicinal doses cause no general effects as a rule, but in susceptible persons it may cause gastric and renal irritation, with hematuria, hemoglobinuria, and albuminuria, also diarrhea, abdominal pain, a measley rash, headache, tinnitus aurium, and strangury. It is an excellent urinary and intestinal antiseptic, and possesses considerable power as a solvent of uric acid, the excretion of which it promotes. It is particularly efficient as an alterative and diuretic in the treatment of cystitis, pyelitis, and phosphaturia. It is advocated as a prophylactic against scarlatinal nephritis and threatened meningitis. The dose for adults is 7 1/2 grains, 2 or 3 times daily, best administered in 1/2 pint of plain or carbonated water. No more than 30 grains should be given in a day.

URTICARIA (**Hives; Nettle-rash**).—An inflammatory affection of the skin, characterized by the formation of evanescent whitish and pinkish elevations, attended by intense itching.

Symptoms.—The eruption appears suddenly, manifesting itself as firm, circumscribed, whitish or pinkish elevations (wheals, pomphi) with a reddish areola. The wheals last from a few minutes to several hours, disappear, and are succeeded by others. They are asymmetric, though usually bilateral, pea-sized or bean-sized, and irregular in shape, often, however, being linear. They may involve any portion of the cutaneous surface, or even the mucous membranes. When the pharynx or larynx is involved, alarming suffocative attacks may occur.

The itching in urticaria is intense, the relief produced by scratching being purchased at the cost of the excitation of new lesions. The skin is markedly sensitive to all sorts of irritation, and responds by the production of wheals. The artificial production of wheals gives rise to the form termed *urticaria factitia*. In some urticarial subjects a word may be inscribed upon the skin with a pointed instrument, and in a few minutes the letters will stand out in wheals as if embossed.

In children urticaria is apt to take the papular form—*urticaria papulosa* (*lichen urticatus*). In such cases there are actual inflammatory papules present, with or without the presence of wheals. The summits of the papules are apt to be excoriated on account of the scratching prompted by the intolerable itching. In some individuals wheals attain the size of an egg or even larger. This form is called *urticaria tuberosa* or *urticaria gigans* (giant urticaria). Hemorrhage into the wheal occurs occasionally, giving rise to the form known as *urticaria hæmorrhagica*. At times the upper layers of the wheal are raised into a bleb by the subjacent serum; this type is designated *urticaria bullosa*.

Urticaria, as a rule, runs an acute course, subsiding in a few days. In exceptional instances, however, it may become chronic, wheals appearing, disappearing, and reappearing, the process extending over a period of months or even years.

Etiology.—The great majority of cases of acute urticaria are produced through the alimentary tract. Substances taken into the stomach may cause urticaria, either by a mechanic irritation of the stomach or bowel or by producing a toxemia. Intestinal parasites and undigested aliment act by mechanic irritation. The substances capable of producing toxemia are almost numberless. They may be primarily toxic, or may only develop their toxicity through putrefactive changes while in the bowel. Again, a large number of substances, both foods and drugs, perfectly innocuous to the ordinary individual, act, on account of idiosyncrasy, as poisons to others. The following articles of food are particularly apt to produce hives: lobsters, crabs, mussels, cheese, sausage, pork, nuts, strawberries, etc.

The following drugs are prone to produce urticarial eruptions: quinin, copaiba, cubebs, salicylic acid, morphin, turpentine, chloral, etc. Urticaria may be produced reflexly also by irritation of viscera other than the alimentary tract. It is sometimes associated with rheumatism and tonsillitis. Thus, irritation of the uterus and adnexa may act as an etiologic factor. Rupture or puncture of hydatid cysts or puncture of pleural effusions may be followed by hives. Again, the disease may be produced by direct local irritation, such as the sting of the nettle, the bite of jelly-fish, mosquito, wasp, etc.

Pathology.—The wheal is produced as a result of direct reflex disturbance of the vasomotor apparatus. The lesion consists of a circumscribed edema of the cutis. A momentary spasm of the cutaneous vessels is followed by a dilatation, with exudation of serum and some leukocytes. At the summit of the lesion the effusion is so great as to produce a pressure anemia, hence the whitish coloration. The peripheral vessels are engorged, which gives rise to the reddish areola.

Diagnosis.—The characteristic features of urticaria are the presence of wheals, their rapid evolution and great evanescence, and the intense itching.

Prognosis.—Acute cases recover in a few days. Chronic cases may persist for a long time, and may exhaust the entire therapeutic armamentarium of the physician.

Treatment.—In severe acute cases seen early an emetic should be administered to get rid of the offending substance. Later, magnesium sulphate is to be employed until free catharsis is produced. In subacute cases salol or phenacetin, in 5- to 10-grain doses after meals, may be used with good results. In chronic cases most earnest efforts should be directed toward the discovery of the cause. The patient's dietary must be the subject of the most careful study. Every detail of occupation, of mode of living, and of habits must be scrutinized. The most careful examination, however, will sometimes fail to disclose any discoverable cause. Most cases will be found to be due to gastrointestinal disturbances. In such the most simple diet should be prescribed. In obstinate cases one will do well to restrict the patient for a few weeks to a milk diet.

In obscure cases some of the following remedies may be tried: atropin by mouth or hypodermically, antipyrin or phenacetin, quinin in full doses, sulphurous acid in dram doses, long-continued course of arsenic in small doses, bromid of potassium, pilocarpin, etc.

Local treatment is necessary to give relief from the harassing itching. The best antipruritic lotions are: Phenol, 1 to 3 drams to the pint; menthol, 5 to 15 grains to the ounce; liquor carbonis detergens, 2 to 3 drams to 8 ounces of water; saturated solution of benzoic acid; alkaline baths (1/4 of a pound of washing soda to 20 gallons of water), etc.

URTICARIA PIGMENTOSA.—An inflammatory affection of the skin, beginning in the first 6 months of infancy, and characterized by buff-colored, wheal-like nodules, with or without itching.

Symptoms.—The eruption is most abundant upon the neck and trunk. It consists of yellowish-red, split-pea-sized nodules or wheals with pinkish areolas. The nodules later become yellow, and may remain stationary for months. Some undergo involution, leaving brownish stains. Itching is often severe, but may be moderate or entirely absent. The disease is very rare.

Prognosis.—The affection usually disappears at or before puberty.

Treatment.—Locally, antipruritic applications. Internal treatment is to be based upon general indications.

UTERUS, ANTEFLEXION.—A bending forward of the fundus of the uterus upon the cervix. This is the normal position of the uterus, but it may be exaggerated sufficiently to cause obstruction of the cervical canal—producing dysmenorrhea and sterility—when it is regarded as pathologic. The point of flexion is usually at the site of the internal os.

Causes.—It is usually congenital in origin, and is due to imperfect development of the body of the uterus. It is frequently associated with imperfect development of the rest of the genital organs—tubes, ovaries, and vagina. It is possible that it may be caused by improper hygienic conditions about the age of puberty, such as improper clothing, insufficient exercise, etc. It is extremely rare to find pathologic anteflexion in a woman who has borne children.

Symptoms.—The most important symptom is dysmenorrhea. The pain is quite characteristic. It is expulsive in character, and is situated in the center of the hypogastric region. It begins several hours before the appearance of the menstrual discharge, and is gradually relieved as the bleeding becomes free. The blood is usually dark colored and clotted. Sterility is commonly present in anteflexion of the uterus, since the obstruction in the cervical canal prevents the entrance of spermatozoa. The imperfect development of the genital organs is a further cause of sterility. The interference with the menstrual flow will finally cause endometritis, which, in its turn, may cause inflammation of the tubes and ovaries.

Diagnosis.—Bimanual examination will reveal the anterior position of the fundus, with the sharp angle of flexion between it and the cervix. These physical signs and the symptoms just described will make an absolute diagnosis of pathologic anteflexion.

Treatment.—Pathologic anteflexion of the uterus should be treated by rapid and forcible dilatation of the cervix. This is performed in the following manner: The patient is etherized and placed in the lithotomy position; the vulva, vagina, hands, and instruments are thoroughly sterilized. The anterior lip of the cervix is seized with a double tenaculum and drawn well down toward the vulva. The small uterine dilator (Wathen's) is introduced, and the cervix is gently dilated 1/2 of an inch or more. This is followed by the introduction of the larger dilator. With this instrument the cervix is gradually dilated up to 1 inch or 1 1/4 inches. To secure a more permanent result, the instrument should be allowed to remain in place 10 or 15 minutes after full dilatation has been accomplished. The instrument is withdrawn and the cervical canal and the vagina are douched with sterile water. A tampon of iodoform gauze is inserted into the vagina; this is removed at the end of 24 hours, and a douche of sterile water is given. The patient should remain in bed a week or 10 days after the operation. The first menstrual period following the operation may be attended by some pain, but usually the subsequent periods are painless. In exceptional cases it may be necessary to repeat the operation.

UTERUS, CARCINOMA.—For description of carcinoma of the cervix see Cervix Uteri.

Cancer of the body of the uterus is a somewhat rare condition when compared to cancer of the cervix. It occurs in only about 2 percent of all cases of cancer of the uterus. It originates in the epithelium of the endometrium.

The causes of cancer of the body of the uterus are not known. Chronic inflammation of the mucous membrane may be a predisposing cause. It occurs later in life than cancer of the cervix—usually between the fiftieth and sixtieth years—and it may attack the nulliparous as well as the parous woman.

The symptoms of cancer of the body of the uterus are about the same as those of cancer of the cervix. There are pain, hemorrhage, and leukorrheal discharge. Vaginal examination shows an enlarged uterus and a patulous cervical canal. When any doubt exists as to the nature of the condition, the uterus should be curetted and the scrapings examined under the microscope.

The treatment should be complete HYSTERECTOMY (*q. v.*). Either the vaginal or the abdominal route may be selected for this operation. Early hysterectomy in these cases offers a very favorable prognosis.

In inoperable cases recently acetone applications or douches have been advocated to stop the bleeding and discharge and improve the general condition. The chief palliative measure is curettage followed by the use of Paquelin's thermocautery. Hemorrhage may be controlled by injections of adrenalin chlorid. It is advisable after the cauterization to apply for a few minutes a tampon soaked with formalin. After the curettage some advocate the application of zinc chlorid or iodized phenol. Permanganate of potassium solution is an excellent disinfectant.

When the area of disease is very extensive tamponades wet or dry may be used to control the hemorrhage and irrigation with potassium permanganate solution should be employed for the copious offensive discharge.

Sarcoma of the uterus is rare. Two varieties have been described: diffuse sarcoma of the mucous membrane and sarcoma of the uterine parenchyma. The symptoms of the former closely resemble those of cancer of the body of the uterus; of the latter, those of fibroid tumor of the uterus. The treatment is complete hysterectomy.

UTERUS, CERVIX.—See CERVIX UTERI.

UTERUS, FIBROID TUMORS.—Fibroid tumors of the uterus are benign but not harmless. They undermine the health and shorten life by hemorrhage, interfere mechanically with the functions of vital organs, become septic, and undergo transformation into sarcoma.

Structure.—Uterine fibroid tumors consist of elements similar to those composing the normal structure of the uterine walls, in which they originate. Connective tissue and muscular fibers are found in varying proportions. The terms used to designate these growths are fibroma, myoma, fibromyoma, and myofibroma; the two latter indicate the varying preponderance of fibroid or muscular tissues. While of mixed character histologically, the natural history of the several varieties is practically the same; hence the common term of fibroid tumors will serve to designate the neoplasms under consideration. These growths vary in size from a small nodule the size of a pea to an immense mass weighing more than 100 pounds. They are seldom single, though one or more may outgrow all others and present the appearance of a single rounded or nodular tumor. They originate in the body of the uterus, most frequently from the posterior wall.

Classification.—It is customary to classify them in accordance with their relation to the normal uterine structures. When situated in the uterine wall, they are termed interstitial; when projecting outward beneath the peritoneum, they are called subserous; and when protruding into the cavity of the uterus, they are known as submucous. When starting from the supravaginal cervix and growing outward between the folds of the broad ligaments, they are termed intraligamentous. The tumors grow in the direction of least resistance and the proximity of the point of origin to the peritoneum or uterine cavity will determine whether a given fibroid tumor will be subserous, submucous, or interstitial. The tumor may be so connected with the uterine wall as to become pedunculated. As a result of traction, pressure, or atrophy the pedicle may become twisted, producing gangrene. When the tumor originates near the uterine mucosa and grows beneath that membrane, it may become extruded into the uterine cavity, forming a pedunculated tumor. This is known as a fibroid polypus. Such a tumor will gradually adapt itself to the form of the uterine cavity. Its presence excites uterine contraction, and after a time it will be forced through the cervix into the vagina. The vascular supply is lessened by this process, and sloughing is very common. The fibroid polypus is more frequently single than any other variety of fibroid tumor of the uterus.

Progress.—Uterine fibroid tumors vary in consistence from the soft, edematous myofibroma to the hard nodules almost wholly composed of fibroid tissue. As a rule, they are of slow growth; in exceptional instances they increase with the rapidity which characterizes ovarian tumors. They frequently cease to grow after the menopause, while in exceptional instances they take on increased activity after that change. In some cases the tumor reaches a certain growth and remains inactive, while in other instances it steadily increases until it occupies the entire abdominal cavity and causes serious symptoms by pressure. During menstruation and pregnancy tumors increase in size. After parturition marked diminution in size takes place, so that a tumor that was conspicuous becomes almost imperceptible.

Sequels.—The tumors under consideration are subject to several forms of degeneration. Edema of these growths is quite common. The entire structure of the tumor becomes infiltrated with a serous fluid. This condition is closely allied to cystic degeneration, in which the constituent elements of the tumor are displaced by serous fluid. Cystic cavities may occur as the result of several degenerative changes, the growth being then known as a fibrocystic tumor. Inflammation may be present in fibroid tumors, often resulting from instrumentation and other agencies. Suppuration may take place. Fibroid tumors of the uterus are prone to sarcomatous degeneration. Some pathologists maintain that uterine sarcoma invariably begins in degeneration of a fibroid tumor. Clinical observation has so far confirmed this view that fibroid tumors are generally regarded as predisposing to sarcoma. Carcinoma is frequently associated with fibroid tumors; but since carcinoma most frequently occurs in the cervix, and fibroids in the body of the uterus, it cannot be claimed that fibroids are disposed to undergo carcinomatous changes.

Age, Race, etc.—Uterine fibroid tumors are common in both the white and black races, but more frequent in the latter. They are found in both nulliparous and multiparous women; indeed, these tumors are among the most common of all the diseases peculiar to women. Unmarried women and married women who have never conceived are especially prone to this disease; from which it is apparent that the arrest of menstruation by pregnancy and lactation, and the retrograde changes accompanying involution, are means of protection against the development of these neoplasms.

Symptoms.—Hemorrhage is the most conspicuous symptom of fibroid tumors of the uterus. While this symptom is observed in the majority of cases, it is not invariably present. Large interstitial and subserous tumors may exist without hemorrhage. Small subserous tumors may present no symptoms. Hemorrhage may occur as a profuse and prolonged menstrual period (menorrhagia), or as a continuous uterine hemorrhage (metrorrhagia). Hemorrhage may be so profuse as to exhaust the patient, or it may be only sufficient to produce a moderate degree of anemia. In cases of submucous tumors (fibroid polypi) the hemorrhage may be so severe as to exsanguinate the patient. The increased area and diseased condition of the endometrium account for the hemorrhage. The site, more than the size of the growth, determines the severity of the hemorrhage.

Pain is a common accompaniment of these tumors. It is the result of various causes, and hence varies in character. The pain of pressure corresponds more to the location than to the size of the growth. When the tumor springs from the lower uterine segment and fills the pelvic excavation, the pressure upon bladder, bowel, and nerve-trunks will give rise to more severe pain than when the tumor rises free above the pelvic brim. Pressure upon the bladder, producing vesical irritation, and pressure upon the bowel, inducing constipation and hemorrhoids, are common. Endometritis, salpingitis, and peritonitis are frequent complications, and cause constant and severe pain. The expulsion of submucous fibroid tumors from the uterus is accompanied by the pain of uterine contraction. The bladder and urethra may be so distorted by the growth of a fibroid tumor that the urine is voided with much pain and difficulty.

The diagnosis is made by observing the symptoms just described, together with careful physical examination. The presence of a tumor, its irregular outline and solid structure, together with its immediate attachment to the uterus, can be determined by bimanual examination. If the tumor is large, its firm consistency and nodular character can be detected by palpation through the abdominal parietes. Interstitial fibroid tumors producing symmetric hypertrophy of the uterus are liable to be mistaken for pregnancy. This is especially marked in the soft and edematous tumors. While generally the diagnosis between uterine fibroma and pregnancy is not difficult, yet one condition has been mistaken for the other, and the error was not discovered until the abdomen was opened. The coexistence of fibroid tumors and pregnancy is not very infrequent, and this fact should be borne in mind.

The differential diagnosis between ovarian cystoma and the soft, edematous variety of uterine fibroid tumors is often most difficult, and to distinguish between a fibrocystic tumor and an ovarian cystoma is also at times exceedingly difficult. Fluctuation exists with all of these alike, and the differential diagnosis can only be made by determining the relation of the growth to the uterus, as indicated by direct mobility of the cervix when the tumor is manipulated through the abdominal parietes. An error in diagnosis here is fortunately not of serious consequence, since the treatment of all tumors of such magnitude consists in removal by abdominal section.

Fibroid tumors springing from the lower segment of the uterus, with adhesions, may readily be mistaken for intrapelvic inflammatory exudate associated with pyosalpinx and ovarian abscess. The reverse of this is also true.

In the diagnosis of submucous fibroids direct exploration of the interior of the uterus with the finger will usually suffice to disclose the character of the growth.

Treatment.—The tendency of **submucous fibroid tumors** of the uterus is to spontaneous cure by becoming polypoid in character, to be afterward extruded from the uterine cavity by persistent uterine contraction. In a majority of cases presenting this form of fibroid growths the tumors will be found projecting from the external os. They vary in size from that of a walnut to large rounded tumors as large as the fetal head at term. If the tumor has been extruded from the uterine cavity through the cervical canal, its removal may be readily and safely accomplished. The danger of hemorrhage after excision in such cases is not serious. Indeed, the blood supply in such growths has been so reduced by the process of pedunculation and protrusion by uterine contraction that the tumor very frequently sloughs from obstructed circulation. It is, however, safer to constrict the pedicle with a wire snare or écraseur, thus slowly crushing the pedicle containing the vascular supply, than to divide it with knife or scissors. In cases of large fibroid polypi that fill the vagina completely it will often be necessary to remove the greater part of the tumor by morcellation before the surgeon can gain access to the pedicle. If the pedicle persists in bleeding after excision of the tumor, the vessels may be caught in a clamp forceps, and left thus secured for 24 hours. Usually, firm packing with gauze will suffice to control the bleeding. This, of course, should only be done after thorough scrubbing of the external genitals with hot water, soap, and brush, the application of an antiseptic douche, and all other aseptic precautions. For the operation, the patient should be placed on a table in the lithotomy position, the perineum should be retracted with Sims' speculum, and the uterus should be brought down and steadied by means of strong tenaculum forceps.

If a submucous fibroid tumor is within the uterine cavity, it will be necessary to dilate the cervix in order to reach the growth and remove it. If the tumor is sessile and low down, and if it can be drawn down near the internal os, the capsule will have to be opened at the most dependent point and stripped away, when the tumor can be seized with the volsellum upon its uncovered surface and enucleated by the finger of the surgeon. Care must be observed, if instruments are used in enucleating, not to penetrate the wall of the uterus. If the capsule is not injured in this procedure, the hemorrhage will be slight, and gauze packing will readily control it. After completing the operation the vagina should be lightly packed with gauze, a pad applied to the vulva, and the patient kept quiet in bed for a week. After from 24 to 48 hours the gauze should be removed and the vagina douched with pure hot water.

The treatment of subserous and interstitial fibroid tumors of the uterus requires the exercise of sound judgment, based on the requirements of individual cases. When the tumor is of small size, unaccompanied by pain, hemorrhage, or other serious symptoms, operation should not be advised, and no special treatment will be required. Under these conditions the patient should be kept under occasional observation and no treatment need be instituted so long as the growth does not markedly increase and while health and comfort are maintained. This course is especially applicable to women with tumors of considerable size who are near the menopause. The mere presence of a small subserous or interstitial fibroid does not indicate any form of treatment and does not forbid activity and exercise on the part of the patient. It is only when such symptoms as hemorrhage with anemia, pressure, and pain are present that symptomatic and palliative treatment is indicated. For all these symptoms rest is most important. Especially should rest be observed during the menstrual periods. Mild purgation with salines relieves congestion by depleting the pelvic circulation, and should be conjoined with rest during the periods. For excessive hemorrhage various drugs —such as ergot, gallic acid, hydrastis, and some preparations of iron—are in popular favor for controlling the bleeding of uterine fibroids, but usually have proved wholly inefficient; and their use begets constipation and congestion, impairs the appetite and digestion, and interferes with the eliminative functions generally. Hemorrhage will be more restrained by rest, saline purgatives, unstimulating diet, and the moderate use of the hot vaginal douche than by the remedies mentioned. Recently, thyroid extract, internally administered, has been highly recommended to control the hemorrhage and to arrest the growth of uterine fibroids, but experience with its use, though limited to a comparatively few cases, has failed to justify the claims made for this remedy. For excessive hemorrhage the most efficient treatment is to curette the uterine mucosa and to pack the cavity with sterilized gauze. This operation, of course, should be done with careful observance of all antiseptic precautions and in a thorough and surgical way.

Electricity does not arrest the growth of the tumor, and the results claimed for it as a hemostatic have not been verified by general experience. Electropuncture has proved harmful instead of efficacious, on account of the traumatic peritonitis following this procedure.

With the improved technic of modern pelvic surgery the operation for removal of uterine fibroid tumors has become so perfected that palliative and expectant methods of treatment have given way to surgical intervention. In skilled hands, and especially with the facilities of modern hospital requirements, the mortality of operations for removal of these growths has been reduced quite as low as that following operations for the removal of ovarian tumors.

While the methods of treatment outlined may alleviate symptoms and prolong life, and while such treatment is eminently appropriate in cases of small tumors without active hemorrhage or severe pain, surgical measures alone can afford the patient permanent relief and cure. Hence, in the majority of cases resort to operative intervention is indicated. The adaptation of the operative procedure to individual cases requires the highest surgical skill and experienced judgment.

Formerly, when the results of operation were marked by severe mortality, women suffering from these tumors were consigned to invalidism, with much suffering, through the active period of life, looking to the menopause for relief. Many died from the pressure effects and hemorrhage of large tumors; others succumbed to the accidents, complications, and degenerations to which these growths are prone; while still others found the menopause deferred or the tumor growing actively after that period. With the perfected methods of modern surgery the dangers of operation have been reduced until they are less than the dangers inseparably connected with the natural progress of these tumors. Operative treatment is now so safe that it is not to be restricted to large tumors, or to smaller growths complicated in various ways by which life is directly threatened; but in cases of fibroid tumors in which the health is impaired by hemorrhage and pressure of less urgency, but sufficient to beget invalidism, permanent relief should be sought through operative intervention. When the tumor is growing actively, and the patient is suffering from pressure and is weakened by hemorrhage, protracted delay to await the increase of symptoms is inadmissible.

The operations which have been devised for the cure of uterine fibroids are: (1) Removal of the uterine appendages; (2) ligation of the uterine arteries through the vagina; (3) myomectomy; and (4) hysteromyomectomy. The first two procedures are practically abandoned. The operation of myomectomy (removal of the tumor and preservation of the uterus) is practised whenever practicable. In most cases of multiple fibroids, and in cases in which the uterus is distorted and enveloped by the growth, hysteromyomectomy is indicated. See HYSTERECTOMY.

UTERUS, INFLAMMATION OF THE MUCOUS MEMBRANE (**Endometritis**).—Inflammation of the mucous membrane of the body of the uterus, or corporeal endometritis, may be acute or chronic.

Acute corporeal endometritis is the result of the introduction into the uterus of septic microorganisms. This usually occurs during labor or miscarriage, or it may result from operations, such as dilatation, or from the introduction of an unclean sound. It sometimes occurs as a complication of the exanthems. If the process is severe enough, it may involve the muscular tissue underneath the mucous membrane, when it is called metritis; or the peritoneal covering of the uterus may be invaded, when it is called perimetritis. See COLON BACILLUS INFECTION.

Symptoms.—Acute corporeal endometritis is usually attended by considerable pain, of a dull, aching character. There are constipation and vesical irritability. The pulse is rapid and temperature in some cases is very high—from 104° to 106° F. Vaginal examination reveals a patulous cervical canal with a profuse purulent discharge escaping from it. The uterus is enlarged, boggy, and tender.

Treatment.—Acute corporeal endometritis following miscarriage or labor should be treated actively. The uterus should be thoroughly curetted, in order to remove any portions of decidua or membranes remaining after parturition. If the symptoms do not subside in the course of 24 hours, intrauterine douches of sterile water may be given 2 or 3 times daily. Free purgation, hot stupes to the lower abdomen, a generous diet of milk and broths, and an abundance of stimulation will be required. In the gravest cases hysterectomy will have to be performed. In less severe cases of acute endometritis rest in bed, vaginal douches of hot, sterile water, and purgation will be sufficient.

Chronic corporeal endometritis may result from an acute attack or it may be chronic from the beginning. One of the most frequent causes of this condition is gonorrheal infection. Chronic endometritis accompanies a variety of pathologic conditions of the uterus, such as displacements, subinvolution, laceration of the cervix, and fibroid tumors.

Two varieties of chronic endometritis have been described—glandular and interstitial.

The symptoms of chronic endometritis are usually well marked. There is pain, of a dull, aching character, most evident in the back and extending down the thighs. Leukorrhea is constant, and is quite characteristic. The discharge is thin, purulent, and blood-streaked. Menstruation is profuse, and lasts usually from 5 to 7 days. The patient's general health suffers; she loses weight and becomes anemic; there is a sense of great reduction in physical strength. Headache is a very common symptom. Nervous, digestive, and circulatory disturbances appear sooner or later. Physical examination reveals an enlarged, tender uterus. The cervical canal is patulous; the external os is eroded. The characteristic discharge can be seen escaping from the cervix.

The treatment of chronic corporeal endometritis will depend upon its cause. It may be necessary to replace a displaced uterus, to remove a fibroid polypus, or to repair a lacerated cervix or perineum. If the condition is due to gonorrheal or septic infection, or if the foregoing measures fail, curettage should be performed.

The steps of the operation are as follows: The patient is prepared for the operation, anesthetized, and placed upon the table in the dorsal position. The anterior lip of the cervix is seized with a tenaculum and is drawn well down toward the vulva. The cervical canal is dilated about 1 inch. A Sims sharp curette is introduced, and the anterior, lateral, and posterior surfaces of the uterus are carefully and thoroughly scraped. This is followed by careful scraping of the fundus and of the region around the uterine opening of the Fallopian tube with a Martin curette. The uterus is now irrigated with sterile water, and the vagina is packed lightly with iodoform gauze. The gauze is removed at the end of 24 hours, the bowels are evacuated at the end of the second day, and the patient is allowed to get out of bed at the end of 10 days or 2 weeks.

If the disease is gonorrheal in origin, the uterine cavity, after curettage and irrigation, should be wiped out with pure carbolic acid. The excess of carbolic acid may be removed by another douche. After curettage the first and sometimes the second and third menstrual periods are missed. Attention to the general health, diet, exercise, and condition of the bowels, and the administration of tonics will be required before complete cure is accomplished.

Tuberculous endometritis is rare and is generally secondary to tuberculosis of the tubes or cervix. Diagnosis may be made by the removal of caseous material by means of the curette, or by the tuberculin test. See ENDOCERVICITIS under CERVIX UTERI.

UTERUS, PROLAPSE.—A sinking of the uterus below its normal level. There are a great many degrees of prolapse of the uterus. It may vary from a slight sinking of the organ to complete extrusion from the vulvar orifice.

Causes.—The most frequent cause of prolapse of the uterus is injury at childbirth—laceration of the perineum. Other causes are: relaxation and elongation of the uterine ligaments; loss of rigidity of the abdominal walls; diminution of the cellular tissue and fat of the pelvis; increase in the weight of the uterus from subinvolution or congestion; and, finally, anything that may cause an increase in intraabdominal pressure, as constant coughing, violent straining, or heavy lifting.

Symptoms.—The symptoms of prolapse of the uterus are not characteristic; neither do they correspond in severity to the degree of prolapse. Slight descent of the organ may cause more disturbance than complete prolapse. The patient usually complains of pain in the back, head, and thighs. The pain in the back is dull and aching in character, and is usually felt most severely over the sacrum. Added to this there is a dragging and feeling of loss of support in the pelvis. Constipation and irritability of the bladder are usually present.

Diagnosis.—Physical examination will readily reveal the condition. The cervix or body of the uterus may project from the vulva. In less severe cases the cervix may be found resting on the pelvic floor. Slight cases of prolapse are the most difficult to diagnose. It will be found, however, that the cervix is lower than normal, and that the uterus can be pushed further upward than usual. It should be remembered that when the patient lies on her back, the prolapse is less marked than when she is erect. Complete prolapse of the uterus should never be mistaken for inversion of the uterus or for a uterine polypus, since their only point of resemblance is in shape.

Treatment.—The treatment of prolapse of the uterus is operative, unless some contraindication to operation exists. In such a case some **mechanic device** should be tried for the support of the uterus. Pessaries are not to be recommended, as their constant use leads to irritation and excoriation of the vaginal walls. Probably the best means for supporting the uterus is by an instrument called Braun's colpeurynter. This instrument is worn only during the day, and can be introduced by the patient herself every morning. The uterus is replaced and the colpeurynter, well anointed with carbolized vaselin and containing about an ounce of water, is introduced into the vagina. It is then distended with air, thus making an even pressure on the vaginal walls and not causing ulcerations.

Operative treatment gives the most satisfactory results in prolapse. In slight cases of prolapse repair of the PERINEUM (*q. v.*) will effect a cure. The severer grades will require, in addition, some operation on the anterior vagina—anterior colporrhaphy. The best of these is Martin's operation for cystocele. Dudley advocates an elliptical bilateral denudation of the vaginal walls. See CYSTOCELE.

If the cervix is hypertrophied it should be amputated. See CERVIX UTERI.

These three operations—Emmet's operation on the perineum, Martin's operation for cystocele, and amputation of the cervix—are required in the usual case of prolapse. In addition, hysterorrhaphy may be advisable, since there can be no prolapse so long as the uterus maintains its normal position of anteflexion. These operations failing, HYSTERECTOMY (*q. v.*) may be performed.

UTERUS, REMOVAL.—See HYSTERECTOMY.

UTERUS, RETRODISPLACEMENTS.—Retrodisplacements of the uterus comprise retrolocation, retroversion and retroflexion. In **retrolocation** the organ may retain its normal relation to the pelvic axis, but the entire organ is displaced backward. This displacement is the result of some inflammatory process in the pelvic peritoneum by which the uterus has been fixed, most frequently by a collection in the retrouterine pouch which has been absorbed.

Retroversion is a rotation of the uterus on its transverse axis by which the fundus of the organ is carried backward and the cervix looks forward.

Retroflexion is a change in the vertical axis of the uterus in which there is a more or less acute angle on its posterior surface between the fundus and cervix. It is usually associated with retroversion, indeed, may be regarded as a later stage of that displacement. Both retroversion and retroflexion may vary from a slight backward displacement, to one of extreme degree, where the fundus in the former, is situated in the pouch between the rectum and the vagina, while the cervix looks directly forward or forward and upward. In the latter, the cervix may occupy the axis of the vagina, while the fundus is below its level. Retroversion is the first stage of prolapse, consequently it is very frequently associated with the latter condition. Not infrequently an anteflexed uterus will also be found retroverted.

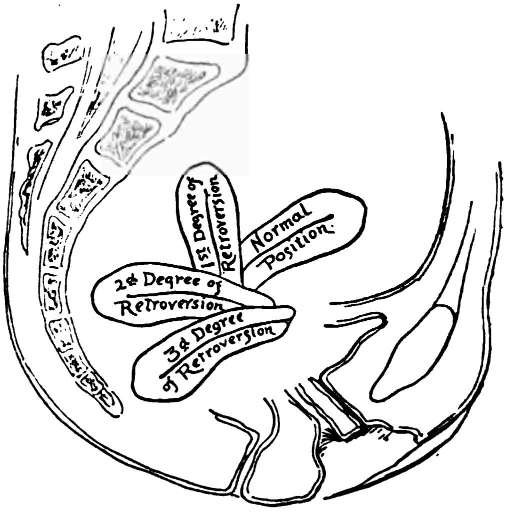

1st Degree of Retroversion
Normal Position
2d Degree of Retroversion
3d Degree of Retroversion

DIAGRAM OF THE DEGREES OF RETROVERSION OF THE UTERUS.—(*Penrose.*)

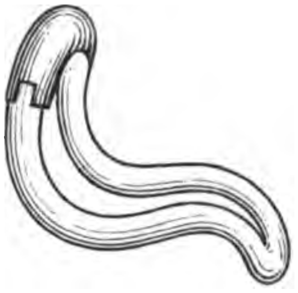
Etiology.—Backward displacements of the uterus are most frequently sequels of parturition. Without doubt, infection, to a more or less degree, is an essential factor. The uterus remains large and heavy, its ligaments, relaxed by the previous pregnancy, are kept in a continuous state of tension which prevents their involution, while the relaxed condition of the abdominal muscles from overdistention suspends the power of aspiration. Improper hygiene in both the pregnant and nonpregnant is an important consideration. Habitual distention of rectum and bladder, and the straining of constipation result in loss of muscular power and increased uterine displacement. Maintenance of the same waist measure, notwithstanding increase of size from pregnancy or additional adipose, necessarily causes greater intraabdominal pressure, and as the enlargement is unable to find accommodation elsewhere it is forced downward, not only adding to the displacement, but making it permanent. Flexions may be produced by irregular involution; thus an inflammation of the site of a placenta which had been implanted on the anterior uterine wall would result in more rapid involution of the posterior wall, causing it to become the string of the bow and draw the fundus backward. Displacements are produced by growths as fibroids, in the uterus or, from the pressure of external tumors, as ovarian cysts, tubal enlargements and pelvic exudates. These displacements may occur in either the single or the married, the nulliparous or parous woman, though more frequent in the latter.

Symptoms are not characteristic. Patients complain of headache, backache, a sensation of weight and dragging in the pelvis, pain and points of anesthesia down the thighs, menorrhagia and leukorrhea, dysmenorrhea, vesical irritability, obstinate constipation, hemorrhoids and anal fissures increasing discomfort in standing and walking, all of which may be aggravated just preceding menstruation, but, as is well-known, these symptoms may be produced by other conditions. Their existence, however, should be sufficient cause for subjecting the patient to a careful pelvic examination.

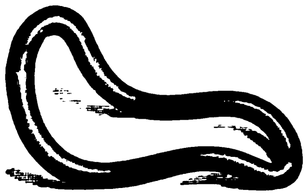
Diagnosis.—Retrodisplacements are readily determined by the bimanual examination. The cervix is situated near the vaginal outlet, in the axis of the vagina, looking forward or even upward. The fundus is absent from its normal situation behind the symphysis, lies posteriorly, and sometimes on the rectum. In retroflexion there is a distinct angle between the fundus and the cervix. Retrolocation is recognized by the organ being drawn upward and fixed near the sacrum. The only condition in which the diagnosis is difficult is when the uterus is surrounded by a mass of exudate in which its relations are more or less lost, but here the inflammatory condition is the condition of greatest significance.

Treatment.—Mechanical and surgical measures may be employed. The mechanical measures—pelvic massage, medicated tampons and pessaries—are applicable where the condition is recent. Where the uterus is still heavy from subinvolution following a recent pregnancy its elevation and maintenance in a proper position by a tampon or suitable pessary so improves the circulation as to rapidly restore it to its proper size, when its ligaments will be sufficient to retain it. Tampons medicated by glycerin preparations have a hydragog effect on the uterus promoting its circulation and the more rapid absorption of the inflammatory or other products which caused the enlargement. They are especially beneficial as a supplementary treatment to pelvic massage in fixation of the uterus by inflammatory exudate. The necessity for operation in recent cases may frequently be avoided by the employment of this combined treatment. The exudate is absorbed, the uterus freed, and the abnormal position corrected. This plan of treatment is futile in old inflammatory conditions, and positively dangerous in the presence of suppuration. The maintenance of the uterus by the pessary in a corrected position is efficacious where the displacement and the condition is uncomplicated. The uterus must be capable of being placed in the correct position, and be so placed, before the pessary is inserted. The pessary does not correct the malposition, but maintains the organ when replaced.

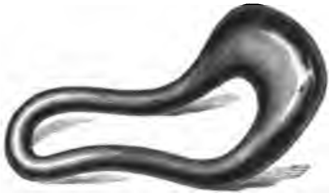
Reposition and Insertion of the Pessary.—The uterus may be placed in its proper position in one of two ways. 1. With the patient in the dorsal position, the operator introduces, where possible, two fingers into the vagina with which the fundus is pushed up and the cervix backward; the other hand, on the abdomen, grasps the fundus and pulls it forward. The manipulation must be practised with the greatest gentleness and the continued cooperation of the patient be secured, otherwise but little can be accomplished. Occasionally, the prominence of the sacrum will be so marked that, by the methods just suggested, the fundus cannot be raised over it; in such circumstances, the cervix should be drawn upon with a tenaculum, or tenaculum forceps, and the fundus pushed forward with the finger in the vagina, after which the cervix can be carried backward with the forceps until the fundus is recognized by the external hand. 2. The patient should be placed in the genupectoral position and the vulva opened with a retractor, when the atmospheric pressure will carry the uterus upward, but not necessarily with the fundus forward. Should it still remain retroverted, the cervix can be grasped with the tenaculum forceps and drawn downward, and then carried backward, when it will be replaced unless there are firm adhesions fixing it. In this position the pessary can be



Thomas' Retroflexion Pessary.

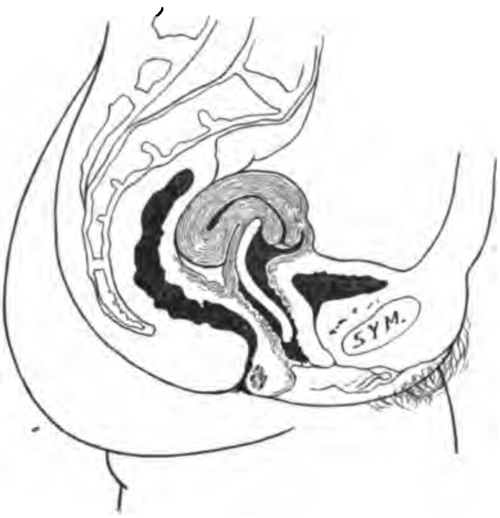


Smith-Hodge Pessary.

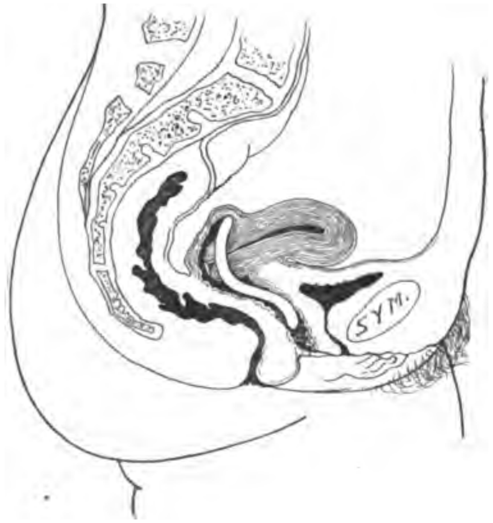


Mundé Pessary.

introduced and carried under the uterus and its relation to the surrounding parts will be apparent to the eye of the physician. In the dorsal position the correction of the malposition is followed by the insertion of the pessary in the following manner: the left hand of the operator separates the labia while the pessary, with its posterior bar held anteroposterior to the vulvar outlet, is made to impinge against the perineum and thus inserted until more than one-half the instrument is buried within the vagina, when it is rotated with the concavity of the greater curvature forward, and the index finger of the right hand carries the posterior bar behind the cervix. The pessary should be sufficiently long to occupy the posterior vaginal fornix without undue pressure, and wide enough to fill the vagina and prevent displacement. The proper size of the pessary can be determined by measuring on the inserted fingers the length from the sacral promontory to the inner surface of the symphysis, and its width by the extent to which the fingers can be separated. An unduly large instrument will soon produce such ulceration and pain that it can not be worn and the cicatricial changes following its use will preclude the employment of any other instrument. An instrument too small will be inefficient and necessarily prejudice the patient against further mechanical procedure. Pessaries of infinite variety have been devised. They are all, however, modifications of the original Hodge pessary. Instruments with a thick and wide posterior bar, are, generally the best, and of these the Mundé and the Thomas are preferable.



Pessary in Faulty Position.— *Montgomery.*)



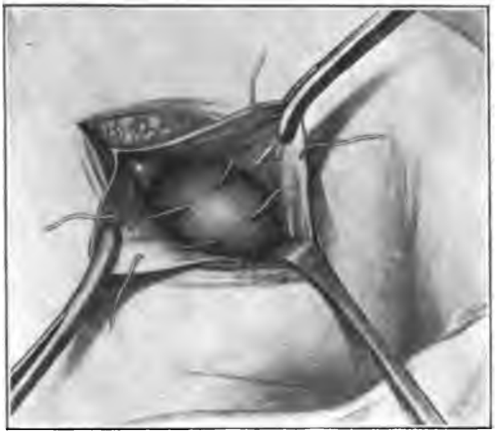
Pessary in Proper Position.—(*Montgomery.*)

After the pessary has been inserted the patient should be directed to rise and sit down, if the presence of the instrument is unrecognized, she can be sent away with the assurance that it is unlikely to produce inconvenience. Should the instrument be partially protruded by straining at stool she should assume the genupectoral position before pushing it back. She should be instructed as to its removal and to permit the physician an opportunity within a week to see that it is causing no inconvenience. No pessary should be retained longer than two months without medical supervision, and the vagina should be kept clean by douching. Alkaline astringent douches should not be employed as they cause salts to be deposited on the pessary which roughen it and render its subsequent use a source of danger. When the pessary is continuously worn for a long period, it produces irritation and not unfrequently becomes more or less imbedded. In cases of chronic displacement, the pessary is objectionable as it is merely palliative and not curative. In retroflexion, it is very unsatisfactory as the uterus is likely to fold over the pessary, and the same condition occurs when the organ has not been properly replaced before the introduction of the instrument. It will be appreciated that the uterus must be freely movable and capable of replacement to make the employment of a pessary practicable. The pessary is contraindicated in lacerations of the cervix, and will not be retained when there has been extensive laceration of the pelvic floor, or in great relaxation of the vagina. At best, the instrument is a crutch, requiring care that it does no injury, and should be regarded as only a temporary expedient.

Surgical Measures.—The number of operative procedures devised for the correction of retrodisplacements is indicative that there exists no ideal procedure applicable to all cases, and that the operation must be adapted to the particular conditions present in the individual patient. Operations have been adapted to the round ligaments at their exit from the inguinal canal and within the peritoneal cavity, to the uterosacral ligaments, through the abdomen or the vagina, and various suspension or fixation operations through either vaginal or abdominal incision.

The Alexander operation was the earliest suggested and performed for the radical restoration of the retrodisplaced uterus. (See ALEXANDER'S OPERATION). It is, however, applicable only to cases in which the uterus is freely movable, and consequently to those in which the operation is least demanded. It is a blind operation and not to be considered when the uterus is fixed by internal adhesions.

Ventrosuspension or *Ventrofixation* devised by Olshausen and perfected by Kelly was for a time performed more frequently than any other operation for retrodisplacements and afforded the advantage over the previously named operation that it permitted treatment of diseased conditions and freeing the fixed organ.



SUTURES INTRODUCED FOR VENTROSUSPENSION. —(*Montgomery.*)

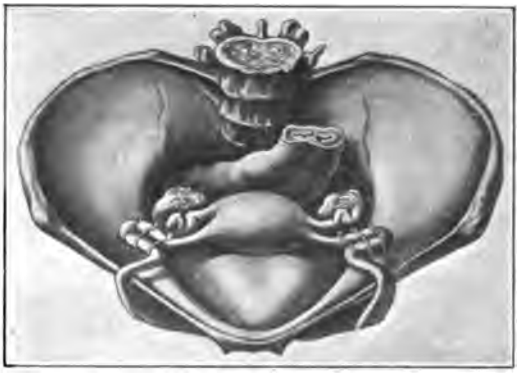
The operation consists of an incision about 2 inches long in the median line just above the symphysis through which the fundus uteri is brought up, and two sutures of silk, silkworm-gut or chromic catgut are passed through the fundus and peritoneum and a portion of the muscle on each side of the incision. The first stitch is on a line with the uterine cornua and the second, one-fourth of an inch behind it. The wound in the abdomen is closed by inserting a chromic catgut suture external to the aponeurosis on the right side of the upper angle of the wound, bringing it through the peritoneum and uniting the latter with a continuous stitch until the lower end is reached, when it is brought through the aponeurosis on the left side; silkworm sutures are then inserted through all the tissues above the peritoneum and the ends temporarily secured with hemostats when the aponeurosis is closed with the continuation of the peritoneal suture and tied at the upper angle of the wound. The tying of the silkworm sutures and the approximation of the skin edges between with plain catgut sutures completes the operation.

Chromic catgut sutures are preferable for securing the uterus as they will ultimately be absorbed and if they become infected are not the cause of the formation of a sinus and of prolonged suppuration as would occur in the nonabsorbable suture.

The portion of the fundus taken up in the suture is not more than one-half an inch in width as the aim is to construct a ligament which will lengthen and not firmly fix the uterus against the abdominal wall.

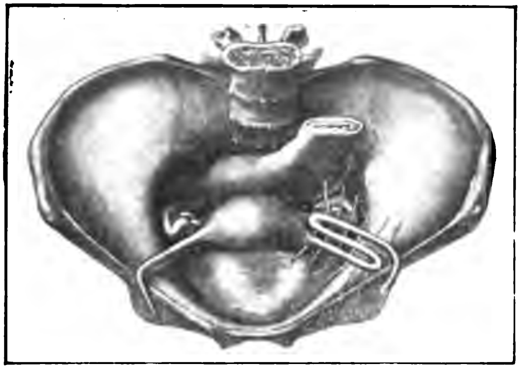
Vaginal Fixation.—Procedures aimed to maintain the uterus forward through an incision of the anterior vaginal fornix have been devised. Duhrrsen secured the anterior wall of the uterus without opening the peritoneum, Mackenrodt opened the peritoneum and placed the suture higher on the fundus, Gottschalk and Vineberg secured a loop of the round ligament in the vaginal wound, Ries through the vaginal incision made a slit in the anterior wall of the uterus and secured a loop of each round ligament in it. Experience disclosed that fixation operations exercised a baneful influence in subsequent pregnancy, producing more or less discomfort during the gestation and became a cause of dystocia at its termination. In spite of careful precautions the operator would sometimes find that as a result of a slight infection or some other cause, an intended suspension had become a fixation. When most favorable a cicatricial ligament was formed which, in quite a number of instances, permitted a knuckle of intestine to become wrapped about it and thus the result was peril, or even, death to the patient. The ligament frequently became attenuated and even broken, permitting the displacement to recur. A fixation operation is no longer considered as applicable to the child-bearing woman.

Intraperitoneal shortening has been done by folding the round ligaments as in the Wylie, Baer, and Mann operations; by denuding the peritoneum over a portion of the ligament, and suturing this to a raw surface on the front of the uterus, the desmopycnosis of Palmer Dudley; by carrying a loop of each ligament through a slit in the anterior uterine wall (Ries); by pushing a loop of each ligament through the broad ligament beneath the ovarian and securing it to the posterior uterine wall (Webster); or, by cutting the ligament near the uterus, tying the proximal end and securing the distal as in the Webster operation (Baldy); by resecting the ligament and uniting the divided ends, at the same time folding the

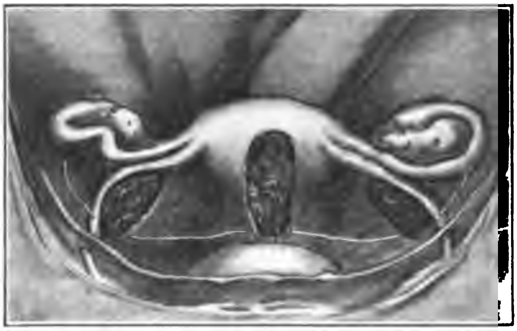


WYLIE'S OPERATION FOR SHORTENING THE ROUND LIGAMENTS WITHIN THE ABDOMEN.

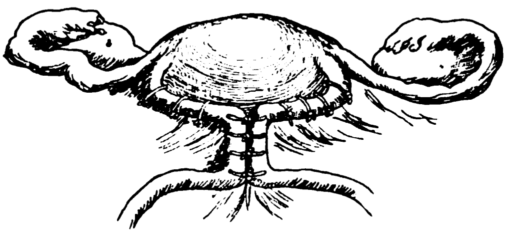
anterior surface of the broad ligament (Bissell); by dragging a loop of each ligament through the abdominal wall and securing it on the external surface of the aponeurosis (Gilliam); by carrying this loop through an incision in the anterior leaflet of the peritoneum and securing it to the under surface of the rectus muscle (Simpson); or by carrying it outward between the layers of the broad ligament and suturing it on the aponeurotic layer (Montgomery). Coffey depends on the cicatricial results of folding the peritoneum, especially in front of the uterus.



MANN'S OPERATION FOR INTRA-ABDOMINAL SHORTENING OF ROUND LIGAMENTS.

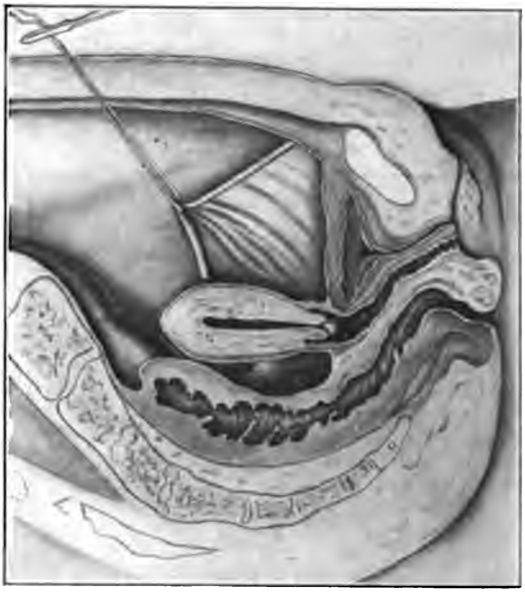


DUDLEY'S OPERATION OF DESMOPYCNOSIS.

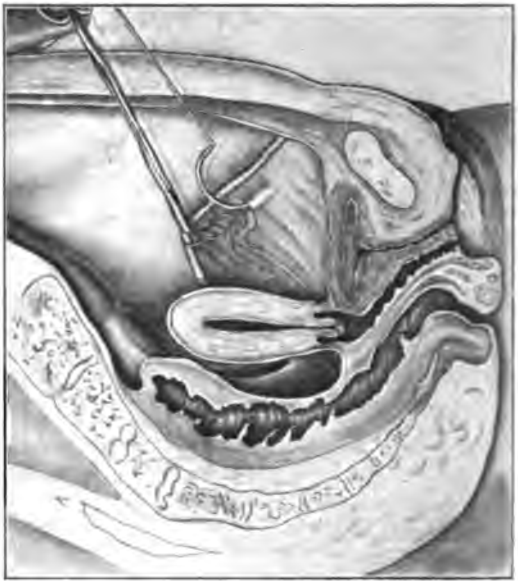


DUDLEY'S OPERATION COMPLETED.

A transverse crescent incision (Pfannenstiel) is made just above the symphysis, in the majority of cases in the hair line, through the skin, superficial fascia and the aponeurosis, the latter stripped from the muscle, when the recti and pyramidales muscles are separated in the median line and the peritoneum opened vertically. This incision permits ready access to the pelvic structures as it is directly over them. Diseased conditions of the tubes and ovaries are treated and adhesions separated.



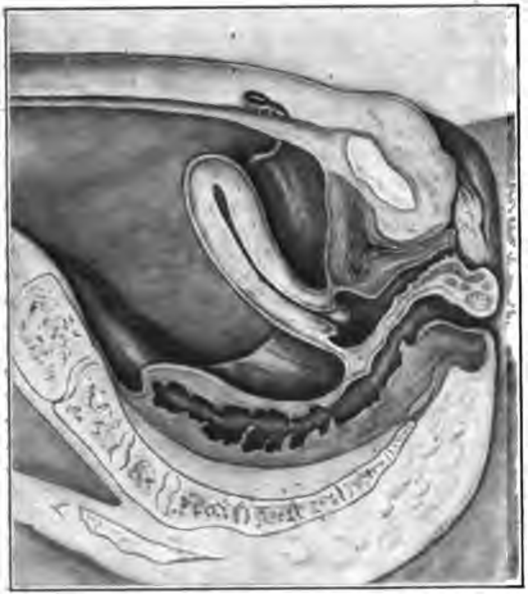
FIRST STEP IN MONTGOMERY'S MODIFICATION OF GILLIAM' OPERATION.



SECOND STEP IN MONTGOMERY'S MODIFICATION OF GILLIAM'S OPERATION.

Showing ligament fixed with hemostat while temporary ligature is carried beneath anterior leaflet of broad ligament with a Deschamps needle.

A ligature is passed beneath the round ligament on either side, the ends of each ligature threaded into the eye of a sharp needle, while the round ligament is held tense in a pair of forceps, the threaded needle is carried through an opening in the anterior leaflet of the broad ligament between its layers until the reflexion of the peritoneum on the anterior wall is reached when it is plunged through and the ends of the ligature removed from the needle and temporarily secured by hemostat. After the opposite ligature is brought through, it is drawn taut and a pair of pointed scissors closed pushed through the opening made by the needle and the blades slightly separated, when the loop of the ligament is easily drawn through. Each loop is secured, by a few chromic catgut stitches. The wound is closed by a chromic catgut suture passed at its upper angle through muscle and peritoneum and afterward as a continuous suture through the peritoneum only, until the lower angle is reached when it is brought out through the muscle and continued in the reverse direction through the muscle edges to the upper angle, where it is tied. Care is exercised not to produce such traction on this suture as to strangulate the muscle. The aponeurosis is likewise closed with a continuous chromic catgut suture, while the skin is united by a continuous suture of plain catgut. Consequently, there are no sutures to remove, and the deeper surfaces are maintained in firm apposition.



COMPLETED OPERATION.—(*Montgomery.*)

This procedure has a number of advantages: there is no place for the intestines to become imprisoned and form unfortunate adhesions, the uterus is supported by ligaments capable of involution and evolution, the patient has the minimum danger of subsequent hernia, and the scar is obscured by the regrowth of the pubic hair.

As has been indicated, there is no operative procedure which will serve in all cases. Where the displacement is accompanied by prolapse, it may be necessary to supplement the procedure by plastic operation on the anterior vaginal wall and the pelvic floor. Lacerations of the cervix should be repaired or the cervix amputated when the latter procedure is preferable.

Intraperitoneal shortening of the uterosacral ligaments, or in case of their extreme attenuation, the quilting together of the peritoneum behind the cervix to lessen the depth of the retrouterine pouch may be necessary to maintain the uterus.

UTERUS, RUPTURE OF.—See POSTPARTUM HEMORRHAGE.

UVA URSI (Bearberry).—The dried leaves of *Arctostaphylos uva-ursi*. It contains gallic and tannic acids, and 3 principles, *arbutin*, a bitter glucosid, neutral, crystalline, resolvable into glucose and hydroquinone; *ericolin*, bitter and amorphous; *ursone*, resinous, neutral, crystalline and tasteless. It is astringent, tonic, and diuretic. It was formerly much employed in calculous disorders of the bladder. It is given in chronic gonnorrhea or gleet, in pyelitis, and in cystitis. It turns the urine dark colored or black when taken in overdose. It has been used in incontinence of urine, in dysuria and strangury, and in uterine hemorrhages; also as a diuretic in cardiac dropsy. Dose, 10 grains to 1 dram in infusion or decoction. **Arbutin** is the glucosid. Dose, 5 to 15 grains.

UVULA, DISEASES.—**Inflammation of the uvula (uvulitis)** often accompanies severe pharyngeal catarrh. The uvula appears red, swollen, and edematous, and often considerably lengthened. If the treatment for the associate pharyngeal catarrh does not relieve the condition, scarification may be practised.

Elongation of the uvula may be due to chronic pharyngeal catarrh or to enlargement of the tonsils and associate conditions. If the elongated uvula comes in contact with the back of the tongue or with the mucous membrane of the larynx, there is a troublesome, tickling cough. The treatment for the causative conditions should be instituted, and if they fail, the organ must be amputated. See PALATE, PHARYNGITIS (Chronic), RHINITIS (Chronic), TONSILS.

V

VACCINATION AND VACCINIA (Cow-pox).—Vaccina is an eruptive disease of the cow, horse, camel, or other animal. Transferred to man by inoculation, it affords protection for varying periods against small-pox. This fact was discovered by Edward Jenner in 1798.

Vaccination is performed by scratching the cuticle slightly and rubbing virus obtained from a calf, or child suffering from vaccinia into the scarifications or abrasions.

The etiology of cow-pox is unknown, though there is strong presumptive and experimental evidence that it is but a modified form of small-pox. Jenner believed this to be the case, and his observations have been confirmed by Gassner, Viborg, Theile, Ceely, Babcock, and many others, down to the present day, when King, Simpson, Leonhard, Voight, and Fisher claim success in producing vaccine of variolous origin; and while it is rather at variance with many known biologic factors, still the so-called spontaneous cow-pox almost invariably makes its appearance in the immediate neighborhood of genuine small-pox.

The Virus.—Undoubtedly, the best form of vaccine virus to use is a glycerinated emulsion of the pulp of the vesicle from a healthy calf. Under the modern method of preparing, this is stored for from 4 to 6 weeks. During this time the glycerin destroys all extraneous organisms, while the organisms of vaccinia increase in power. Prepared in this form, the vaccine virus retains its activity for many months, and when used, produces the typical pock of vaccinia and is accompanied by very moderate local or constitutional disturbances and by only a slight febrile reaction. There is no doubt that the pronounced areola, swelling of the limb, tenderness of neighboring glands, and more or less grave depression occasionally seen, are the results of the accompanying organisms either contained in the vaccine or accidentally introduced subsequently; but as they were inseparable under the old methods of production, many laymen and some physicians still regard with doubt the success of a vaccination unaccompanied by "sore arms."

Virus dried on points cannot be sterilized by any process known at the present time, and under the strictest precautions that can be observed it will be contaminated in the vast majority of cases; hence it is wise to use the glycerinated virus when obtainable. Every physician appreciates the fact that it is difficult thoroughly to disinfect the human skin, for the reason that several varieties of organisms find their habitat upon its surface, in and under the superficial layers and also deep down in the hair follicles. In the cow this is more marked.

It has been found by repeated culture tests that the normal serum, which in health is sterile, drawn from the scarifications on an animal before vaccination, and after a most thorough antiseptic toilet, is in the vast majority of cases contaminated by a variety of organisms, most, if not all, of a non-pathogenic character; but one especially persistent streptococcus has certain cultural and microscopic characteristics leading to the belief that under proper stimulus it might be awakened into harmful activity.

Deep pitting of the resulting cicatrix is probably caused by the action of some of these extraneous organisms. Thorough immunity can be conferred by subcuticular inoculation with sterile virus in which very little, if any, scar is left.

Technic.—It is well to bear in mind, when vaccinating a child, that the remaining scar is unsightly, and on a girl's arm, in certain stations of life, a disfigurement to be avoided, if possible. This fact cannot be overlooked, and it is well to be guided by the mother's wishes, as there is no reason why some other portion of the body, such as the outer aspect of the thigh or the calf of the leg, should not be selected, provided the parts where the blood-vessels are thinly covered or where there are large masses of lymphatics are avoided. In the absence of such reason or in the case of a boy the classic site, above the insertion of the deltoid on either arm, possesses advantages besides that of custom. This area is readily accessible for operation and inspection, and can be protected from violence.

Vaccination is usually performed during the first 4 months of life, and, if unsuccessful, should be repeated at intervals, immunity, so called, being rare; the failure, in a vast majority of cases, is due to poor or inert virus.

Having selected a site, cleanse the surface with alcohol or ether, applied with a piece of absorbent cotton; then wash thoroughly with boiled water, or, if there is reason to suspect infection of any sort—such as suppurating wounds, contagious diseases, etc., in the same family or house—it is well to use a solution of bichlorid of mercury 1 : 5000 or 5 percent phenol solution, being careful to wash away every trace of the antiseptic with boiled water; otherwise, the vaccination will probably be unsuccessful. It is rarely necessary to use the stronger antiseptics in children or adults of cleanly habits and surroundings.

Grasp the limb with the left hand, stretching the skin between the index-finger and the thumb, blanching it, and scarify one or two spots by cross-hatching, thus bringing to the surface a little serum, each spot to be about 1/3 of an inch square, and to be separated by an inch of healthy skin in order to prevent coalescence of the vesicles if more than one scarification is made. Bear in mind that one typical vesicle the size of a pea affords as much and as thorough protection as will a dozen larger ones. However, it is well, at times, to perform multiple vaccinations on a child whose parents are at all reluctant and not likely to return in case the primary vaccination fails, the larger number of spots lessening the danger, as one is almost certain to introduce the active principle of vaccinia into one or more of the spots. Care and thoroughness, if virus is active, will insure success in single-spot primary vaccinations.

An ordinary sewing-needle is by all means the best kind of scarifier. It can be obtained in every house, and is furnished by some of the producers with each vaccination. It is readily sterilized by passing it through the flame of a match, candle, gas, or other light. It will tear rather than cut the cutaneous vessels and absorbents, doing away with bleeding, and by slightly bruising the tissues, prepares a more favorable soil for the vaccine organism to grow upon. If virus dried on ivory points is used, the point itself makes a good scarifier. The physician should never use a pocket lance or scarifier unless it can be, and is, thoroughly sterilized before each vaccination. And he should not overlook the fact that all these precautions are useless if his own hands are not surgically clean. The virus selected is rubbed into the scarification, either by reversing the needle and using the eye, or by, what is preferred, a little splint of hard wood (an orange-wood toothpick with one end spade-shaped answers perfectly). Rub the virus well into the scarification, and keep uncovered until dry. It is well to protect the forming scab, especially in young children, by some form of shield. Many, however, prefer a sterile gauze compress fastened by adhesive plaster. It is important to protect the crust or scab from violence, as it undoubtedly is the best protective, unless it becomes very purulent. In this case it should be removed with a sharp curette and treated as an infected wound.

Hutchin has suggested a method which is especially valuable in children: After the site selected is cleansed, a bit of cotton wet with liquor potassæ is applied for 2 or 3 minutes. After its removal, the site is dried and gently rubbed with moist cotton. Thus the epidermis is readily removed and the vaccine may be applied and allowed to dry.

In normal vaccination there is a gradual increase of redness at the point of inoculation, and on the third day there is a slight shotty feeling, followed by small vesicles on the fourth and more pronounced vesicular on the following day, the vesicles becoming confluent on the seventh day, when the temperature reaches its maximum. About the eleventh or twelfth day the areola should disappear and the scab begin to dry. This continues until about the twenty-first day, when it becomes detached, leaving a healthy, cicatrized base. See also SMALL-POX.

VACCINE THERAPY.—Vaccine or, better, bacterin therapy is a method of treating diseases due to bacterial action, based on the principle that the injection of killed bacteria increases the bactericidal power of the body by stimulating the production of antibodies. The immunity thus produced, which is of variable duration, is an *active immunity*, in contradistinction to the passive immunity which follows the administration of antitoxic sera. The *antibodies* are present in the tissues of the body generally, in exudates and transudates, as well as in the blood plasma. The term *opsonins* was employed by Wright to describe these substances, because they have the property of preparing or sensitizing bacteria for ingestion by the phagocytes (phagocytosis), and the determination of the *opsonic index* is merely a method of ascertaining the phase of active immunity of an individual against a given bacterial infection. Opsonins, however, are not the only antibodies produced by the injection of *antigens* (vaccines or bacterins), or by the entrance of pathogenic bacteria into the body in the ordinary genesis of "disease," and the opsonic index is therefore not an absolutely trustworthy criterion of the individual's resistance or immunity. In a general way the opsonic index and the clinical symptoms run an approximately parallel course, and for this reason, as well as because the technic of opsonin determinations is difficult and time-consuming, besides not being altogether reliable, it is generally held that *clinical control* is a more satisfactory guide in the management of the case with regard to dosage, intervals between injections, etc. It does not suffice, however, to observe such obvious phenomena as rise of temperature, variations in the leukocyte count, changes in weight, and local manifestations in the disease focus or at the point of inoculation; such minor deviations from the normal as malaise, slight indisposition to work, loss of appetite, and the like must receive careful attention in the intelligent application of bacterin therapy. In some instances, when there is an absolute lack of subjective or objective signs, the opsonic index is distinctly helpful, as, when there is fever; when the lesion is deep-seated, as a pyelitis or pyelonephritis, or a suppurative otitis media; in acne and furunculosis, when the lesions have disappeared and it is important to know how long the treatment should be continued.

Determination of the Opsonic Index.—The opsonic index is the ratio of the phagocytic activity of an individual's leukocytes compared to that of the leukocytes in a normal or control serum. Thus, if 100 leukocytes in the serum to be investigated are found to contain 850 bacteria, while the same number of leukocytes with normal serum ingest 1000 bacteria, the patient's opsonic index is equivalent to 0.85 (850 : 1000 :: x : 1). The *technic* is as follows: A few drops of the patient's blood and of the control blood are collected in two glass tubes and allowed to coagulate in order to separate the serum. Ten to fifteen drops of normal blood are then allowed to fall into a normal salt solution containing 1 1/2 percent sodium citrate. This prevents clotting, and the corpuscles are thoroughly washed by centrifugation in normal salt solution until they are absolutely neutral and free from serum. The leukocytes, being lighter than the red cells, float on top and are transferred with a pipette to another tube. A culture of the given bacterium is washed in normal salt solution and centrifuged, so that the supernatant suspension or emulsion contains only individual bacteria in not too great concentration. Two opsonizing pipettes, P (patient) and C (control), about the caliber of a large hatpin, are marked at a distance of about 1/2 or 3/4 of an inch and, by means of a rubber bulb, equal quantities of patient's serum, bacterial suspension, and washed leukocytes are drawn up and mixed in the pipette P, and the same performance repeated with pipette C, except that control serum instead of patient's serum is mixed with bacteria and leukocytes. The tips are then sealed in the flame and the two pipettes incubated for a few minutes in a thermostat at 37° C. (98.6° F.), shaking the tubes at short intervals during the incubation to insure a uniform mixture of bacteria, serum and leukocytes. Smears are then made from the pipettes, fixed and stained. The number of bacteria contained in at least 100 phagocytes should be counted and the index determined as explained; or Simon's method of determining the ratio of the number of phagocyting leukocytes, which is simpler and quite as reliable as the method of Wright, may be used. If the index is less than 1, the patient is said to be in the "*negative phase*," and it is the aim in bacterin therapy to cause the index to rise into the "*positive phase*," and maintain it there.

Preparation of Bacterins.—The process consists in preparing an emulsion of bacterial culture (24 hour) in normal salt solution, adding 0.5 percent phenol, and agitating the emulsion in a mechanical shaker for from 1/2 to 1 hour to insure uniformity. The emulsion is then standardized, by means of an ordinary hemocytometer, to contain from 100,000,000 to 1000,000,000 bacteria per cubic centimeter. Finally the bacteria are killed by exposure in a water bath to a temperature of 60° to 65° C. (140° to 150° F.) for 1/2 to 1 hour. The consensus of opinion is in favor of "*autogenous*" bacterins whenever it is feasible to cultivate the bacterium in question, but good results are reported from the use of "*stock*" preparations, especially *polyvalent* bacterins, representing several strains of the bacterium. It is to be remembered also that the bacterial flora in some cases of suppuration has a tendency to vary from time to time; in such cases the pus should be cultivated and recultivated at intervals, and only an autogenous bacterin employed. Tuberculous disease of bones and joints calls for accurate bacterial diagnosis to establish the identity of the pyogenic microorganism, the bacterin of which is then associated in the treatment with tuberculin. Some bacteria do not lend themselves readily to cultivation, and autogenous bacterins of such organisms are therefore not obtainable; the principal examples of this type are the tubercle bacillus and the gonococcus.

Administration and Dosage.—Bacterins are to be injected *subcutaneously*, the site of injection being a matter of choice or convenience. The forearm is the region usually selected. Ordinary aseptic precautions as in the case of all hypodermic injections, are to be observed. The size of the *dose* is determined in part empirically, in part by the nature of the affection, whether acute or chronic, the presence of fever, the patient's resistance and the individual bacterin to be used. Thomas' golden rule is "the sicker the patient the smaller the dose." In acute infections, if bacterins are used at all, the dose must be very small at first and increased with great caution; while in local, chronic lesions the treatment may be pushed more rapidly. The conventional initial dose, moreover, varies with different bacteria. The *intervals* between injections may vary from 5 days to a week or more; there can be no hard and fast rule either with regard to intervals between inoculations or the size of the dose, which must be determined in every individual case by a study of the clinical symptoms or, possibly, the opsonic index.

Certain **accessory procedures** should be mentioned in connection with bacterin therapy, particularly in refractory cases—old chronic sinuses, old inflammatory exudates that have become walled off, and the like. The blood may be plentifully supplied with antibodies in such cases, but unable to gain access to the disease focus. Bier's method of hyperemia, local application of heat, massage, incisions, the internal administration of citric acid to diminish the viscosity of the blood, or flushing the diseased area with 0.5 percent sodium citrate to promote dissolution of the fibrin in the lymph-spaces and 5 percent salt or 10 percent sugar solution to favor osmosis of the blood-lymph, are some of the measures recommended.

Indications and Contraindications.—In the most general way it may be stated that bacterins are most effective in *localized, suppurating lesions* of the skin and mucous membranes, such as abscesses in the subcutaneous tissues, acne, furunculosis, sycosis and carbuncles, and *ocular lesions*—keratitis, corneal ulcer, conjunctivitis, iritis and uveitis. Chronic conditions respond more readily than acute infections. Bacterial inoculations are useful also in certain *deep-seated affections*; chronic sinuses after celiotomies or leading to a kidney the seat of pyelonephritis; certain *affections of the urogenital system*—cystitis, prostatitis, *vulvovaginitis of children*, pyelitis and the like; *gonorrheal arthritis;* chronic osteomyelitis and osteoperiostitis whether of pyogenic or tuberculous origin. On the other hand, bacterin therapy is postively *contraindicated* in all diffuse infections characterized by septicemia or pyemia, and in all severe acute infections—pneumonia, typhoid fever—when the body is already overwhelmed by the bacterial invasion, and whenever there is a suspicion of bacteremia.

Space does not permit, nor is it necessary, to enumerate individually all the pathogenic bacteria that lend themselves to the method of bacterin therapy. Tuberculin, which is in effect a bacterin, will be discussed at length, however, and the most essential points in regard to the employment of other bacterins which have been subjected to a practical test will be briefly touched upon.

Tuberculin.

Koch's original product represented a "glycerin extract of pure cultures of the tubercle bacillus, containing an active substance insoluble in alcohol, and all the products of the growth of the bacillus soluble in 50 percent glycerin." This crude tuberculin has now been supplanted by improved preparations in human medicine.

Preparation.—The tuberculin in current use represents either (1) a filtered extract of bouillon culture, containing, therefore, only soluble products of the bacilli; or (2) an emulsion which contains all or the greater portion of the bacterial bodies themselves. **Old Tuberculin ("O. T."** *Alttuberkulin*), is the chief representative of the first class, to which also belongs **Purified Tuberculin** (*Tuberculin Purum*, **Endotin**). The second class inculdes **New Tuberculin (Tuberculin R., "T. R.,"** meaning "residual tuberculin" because it is the solid residue of the first centrifugation) and **Bacillus Emulsion ("B. E.,"** "*Bazillenemulsion*"). These may be regarded as true *vaccines* or *bacterins;* that is, suspensions of killed bacteria in physiologic salt solution, or other suitable medium.[*]

Tuberculin Preparations.

Old Tuberculin, "O. T."—*Synonyms:* Koch's tuberculin, tuberculin Koch, original tuberculin; Alttuberkulin, Alttuberkulin Koch.

A filtered glycerin extract of tubercle bacilli. Old tuberculin is a clear, syrupy, amber-colored fluid, of a peculiar, characteristic odor and sweetish taste.

Preparation.—A bouillon culture of tubercle bacilli, 6 to 8 weeks old and containing 5 percent of glycerin, is evaporated and concentrated to 1/10 its volume (preferably in a water bath to avoid high heat). The devitalized germs from which the toxic substances have thus been extracted are then removed by filtration through porcelain. The finished product contains 50 percent of glycerin and should be diluted at least two-thirds when used for hypodermic injection.

Initial Maximal Dose.—One-thousandth of a milligram (0.001 mgm.) hypodermically. (See "Tuberculin Serial Dilutions," and "Abrasion," "Tuberculin for Diagnostic Purposes").

Tuberculin Filtrate. Synonyms.—Tuberculin Denys, "B. F.," Bouillon Filtrate; Bouillon filtré, Denys; Denys Tuberkulin.

The bouillon from cultures on which tubercle bacilli of the human type have been grown to maturity (5 to 6 weeks), freed from germs by filtration through porcelain. This preparation differs essentially from "old" tuberculin in the fact that no heat is used in its manufacture.

Initial Maximal Dose.—One-thousandth of a milligram (0.001 mgm.). (See TUBERCULIN, SERIAL DILUTIONS.)

New Tuberculin, "T. R." Synonyms.—Tuberkulin, Rest, Tubercle Bacilli Residue, "T. R." (*Rückstand*); Neutuberkulin Koch, "T. R.," Tuberculin "T. R."

A glycerinated saline suspension of the major portion of the sediment remaining after centrifugating desiccated and pulverized tubercle bacilli, which have been triturated with physiologic salt solution.

Preparation.—A virulent culture of tubercle bacilli is dried in vacuo and finely pulverized. The finely powdered bacilli are then triturated with a definite quantity of physiologic salt solution, centrifuged, and the supernatant, opalescent fluid containing extractives and fatty substances mixed with comminuted bacilli (known as Tuberkulin Oberer, "T. O.") is removed and discarded. The sediment is again triturated with another portion of physiologic salt solution and centrifuged, and the process is repeated until almost no sediment remains. The centrifugates are then mixed and sufficient glycerin added to insure the presence of 20 percent in the finished product. The finished product is then standardized, so that each cubic centimeter represents the active substance found in.10 mgm. of the original dried tubercle bacilli.

Initial maximal dose: One-ten-thousandth of a milligram (0.0001 mgm.).

Purified Tuberculin. Synonyms.—Tuberculinum Purum, "T. P."—*Endotin.* The purified extract of a filtered culture of (human) tubercle bacilli in 50 percent glycerin.

Preparation.—Koch's old tuberculin is treated with alcohol, ether, chloroform and xylol in order to remove the deuteroalbumoses present. Endotin is supplied in packages containing 7 ampoules each, progressively graded in strength, which are intended to represent one course of treatment.

Initial maximal dose: One-fiftieth of a milligram (0.02 mgm.), by hypodermic injection.

Tubercle Bacillus Emulsion. Synonyms.—New Tuberculin, "B. E.," Bacillary emulsion; Neutuberkulin, Bazillenemulsion. A glycerinated suspension of devitalized tubercle bacilli.

Preparations.—A virulent culture of tubercle bacilli is dried *in vacuo*, and finely powdered in the same manner as in the preparation of "T. R." The finely powdered bacilli are then mixed with equal parts of water and glycerin. The resulting suspension should contain 5 mgm. of dried substance in 1 c.c.

Initial maximal dose: One-ten-thousandth of a milligram (00.0001 mgm.).

Dixon's Tubercle Bacilli Extract (Fluid of Dixon).—An extract of tubercle bacilli dissolved in normal saline solution, marketed in syringes containing the extract from 1 mgm. of bacilli.

The *standard therapeutic dose* is a weekly injection of the contents of 1 syringe, to be reduced in amount and frequency if the patient shows signs of reaction.

Dixon's Suspension of Dead Tubercle Bacilli.—A suspension in normal saline solution of killed tubercle bacilli, which have been decreased by prolonged treatment with alcohol and ether.

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[*] **"T. O."** is sometimes used instead of **"O. T."** to designate 'Old" or "Original" Tuberculin. This is an error. "T. O." means *Tuberkulin Oberer*, a by-product in making New Tuberculin, "T. R.".

"*Tuberculin Koch*" is claimed by a German manufacturer as a trade-mark, and when thus specified, pharmacists may feel under obligation to dispense only the controlled preparation. Hence the term is avoided in the text. The same house also claims the word "*Tuberculin*" as private property. This claim, however, is scarely to be conceded by scientific writers.

Some manufacturers furnish tuberculin of bovine, as well as human type.

This is marketed in syringes containing 1/1000 mgm. of bacilli, which is the *standard therapeutic dose.*

Spengler's Perlsucht ("P. T. O.") is prepared from the bacillus of "pearl disease," which is a true bovine tuberculosis. The preparation is the same as that of old tuberculin. According to Spengler, fever and mixed infection do not contraindicate its use, since it is but slightly toxic for human beings.

Initial maximal dose: One-thousandth of a milligram (0.001 mgm.) by hypodermic injection.

Diagnostic Use of Tuberculin.

Tuberculin as a therapeutic agent, after the early unsuccessful and even disastrous results which followed its use in pulmonary tuberculosis, was practically abandoned, and even the diagnostic use of tuberculin gradually fell into disrepute until, in quite recent years, the announcement by Wolff-Eisner and Calmette of a new method of applying this specific test, followed by several additional methods proposed by other investigators, revived the interest in tuberculin diagnosis.

Tuberculin Reaction.—When a sufficiently large dose of tuberculin—from 0.5 to 2.5 mgm. of old tuberculin—is injected subcutaneously into a normal, non-tuberculous individual, certain constitutional and local effects are observed, which constitute a tuberculin reaction.

From 3 to 4 hours after the injection *general lassitude,* with weakness and numbness of the extremities and more or less desire to cough, begins to manifest itself and rapidly increases in degree to decided oppression or prostration. Then follows a *chill,* which is characteristic of the tuberculin reaction and lasts about an hour. The *temperature* at the same time rises and, at the end of 12 hours, reaches about 103° F. (39.6 C.). Increased frequency of pulse and respiration, and in many cases nausea and vomiting, accompany the pyrexia. After some 12 hours longer, the temperature begins to fall, the constitutional symptoms subside, and by the following day normal conditions are, in the main, restored. The numbness and aching of the limbs and the general depression may, however, persist for a few days. *The site of injection* is slightly reddened and painful, but abscess formation is extremely rare.

To produce these effects in a normal, robust adult, a dose of at least 10 mgm. of old tuberculin is usually necessary. Nearly every one injected with this dose, however, experiences more or less pain in the limbs and lassitude lasting for some time, and usually a slight elevation of temperature, from 0.5° to 1° F. (0.3° to 0.6° C.).

Reaction in the Tuberculous.—In tuberculous subjects the injection of a very much smaller quantity—0.01 mgm. or less—of old tuberculin suffices to bring about the above described reaction. The *temperature* reaches 105° F. or even higher, and the rise is usually preceded by rigor; the pain in the limbs is severe; nausea and vomiting are frequently present, and sometimes accompanied by slight jaundice; the urine may contain albumin and blood. A scarlatiniform rash appears upon the neck and chest. The reaction begins from 4 to 5 hours after the injection and lasts about 15 hours. Patients with recent and rapidly progressing lesions exhibit the most pronounced disturbances; in chronic, and especially in fibroid cases, the phenomena are comparatively mild. With the original Koch lymph reactions were also observed in lepers, in patients suffering from lupus, and in syphilitics with secondary lesions.

Local Reaction.—A lupous lesion of the face, some hours after an injection of tuberculin, exhibits an increase of redness and inflammation, which extends to new areas during the reactive febrile period. The lupous tissue becomes brown and finally necrotic. As the temperature falls, the swelling of the affected tissues diminishes little by little, and disappears in 2 or 3 days. During this time the lesions are covered with crusts, formed by the exuded serum which has dried in the air. These come away in the course of 2 or 3 weeks, leaving a smooth, shining, red cicatrix.

Internal Local Reaction.—Tuberculin appears to excite irritation, inflammation and necrosis in tuberculous tissue, and this reaction, if severe, may prove dangerous in certain localities, especially the larynx. In early cases of *pulmonary tuberculosis* the primary irritation may be followed by absorption or removal by expectoration of the tuberculous tissue, and stimulation of reparative processes. Clinically the reaction manifests itself by temporary *increase in the local signs* and *aggravation of the cough.* It is generally believed that the tuberculin reaction is accompanied by the migration of a large number of leukocytes, which attack the necrotic tissue elements as well as the bacilli themselves and remove them through the circulation. It also excites the production of antibodies, which probably play some part in the destructive or reparative changes in foci of tuberculous tissue. The temporary tolerance induced by the injection of progressively increasing doses of tuberculin is an antitoxic reaction.

Opsonic Reaction.—An injection of tuberculin is followed by the same series of changes in the opsonic index as that observed after the injection of bacterial vaccines in general. The primary *negative phase* is succeeded after a variable interval, depending upon the individual's initial index and the quantity of tuberculin injected, by a *positive phase* or period of increased opsonin production, induced by more active phagocytosis.

There are at present four recognized methods of tuberculin diagnosis:

1. **The Subcutaneous Test** (Koch), applied by hypodermic injection of old tuberculin. In tuberculous subjects it excites a reaction marked by (1) constitutional, usually febrile disturbances, and (2) the development or increased distinctness of local symptoms. The method of application is as follows:

The temperature and pulse rate of the patient to be investigated are carefully noted for from 4 to 7 days, after which, if these are normal or only slightly elevated, an initial injection of 0.5 mgm. of old tuberculin is given. If no reaction follows this in from 3 to 4 days, the same dose is repeated, without increase, particularly if any symptoms indicative of a mild reaction have occurred. If the temperature shows any irregularities, a longer interval is allowed to elapse and the same dose repeated a third time. Usually, however, in the absence of a reaction, the dose at the second injection is increased to 1.25 mgm. This may be repeated if two or three days again elapse without reaction; or the dose may be increased to 2.5 mgm., which is to be regarded as the maximal dose for diagnostic purposes. If reaction is still wanting, however, the maximal dose may be repeated. The importance, at each stage of the test, of repeating the same dose before increasing the quantity is to be emphasized. Often a merely suggestive reaction after the first injection is followed by severe symptoms after a second dose of the same strength.

A rise in temperature of 1° F. (0.5° C.) above the previous maximum is accepted as a *positive sign;* but a less marked rise is not necessarily negative. General constitutional disturbance and increased activity of local phenomena—for example, the development of râles where they were previously absent—are also to be considered positive, even when the temperature is but slightly augmented.

In suitable cases there is no danger in the test as outlined, if the patient is kept in bed until the disturbances of reaction have subsided, or a negative result is clearly evident. A few days of rest usually suffice.

Contraindications.—The method should not be employed in the presence of nephritis or tuberculosis of the kidneys, when there have been recent hemorrhages. It is also to be avoided in ill-nourished individuals and during convalescence from any acute infection.

Prognostic Value.—There appears to be a direct relation between the degree of reaction and the severity of the tuberculosis infection. As a rule, marked reaction is a relatively favorable sign, and sluggish reaction is relatively unfavorable. Thus the disturbance is greater in recent infections than in cases of long standing. In advanced tuberculosis the test may prove negative, indicating that the patient's resisting powers are exhausted, and the prognosis in such cases is correspondingly grave.

2. **The Ophthalmic Reaction** (Calmette; Wolff-Eisner).—In this method a drop of 1 to 5 percent old tuberculin solution is instilled into the conjunctival sac. The reaction, which appears about 8 hours later, consists in hyperemia and redness of the caruncle or of the entire palpebral and orbital conjunctiva, with a slight fibrinous or fibrino-serous, grayish exudate. Reaction is not infrequently delayed for 48 hours and remains well-defined for 2 or 3 days. Three grades are recognized: (1) Moderate redness of the caruncle and conjunctiva; (2) more intense hyperemia of the conjunctiva, with fibrinous exudation; (3) deep injection of the entire conjunctiva and chemosis, with swelling of the external tissues.

The ophthalmic test is not without danger and has practically been superseded by the safer cutaneous methods. Special contraindications are the presence of ocular tuberculosis or a history of tuberculous keratitis, phlyctenular conjunctivitis or, according to most authorities, any form of conjunctivitis.

3. **The Cutaneous Test** (von Pirquet).—See TUBERCULIN (Cutaneous Reaction).

(4) **The Inunction Test** (Moro).—A small quantity of old tuberculin undiluted or in a 50 percent solution (old tuberculin 5 c.c., anhydrous wool fat 5 gm.) is rubbed vigorously into the skin for about half a minute, and the area covered with a protective dressing to permit absorption. The finger used in making the inunction should be protected with a rubber cot, or a flat glass stopper may be used for the rubbing. The crop of papules which results in a positive case is quite characteristic. They appear in from 6 to 24 hours and persist for 2 or 3 days. An area equal to about 4 or 5 square inches is selected on the chest or abdomen and, for the purpose of control, a similar area is subjected to the same treatment with petrolatum or other neutral substance.

Of the various methods of tuberculin diagnosis the cutaneous test after von Pirquet appears to be the most satisfactory and is now generally adopted as a routine diagnostic procedure in clinical work. Opinions in regard to the comparative value and the significance of the various tuberculin tests are constantly changing, and dogmatic statement is, therefore, as yet premature. The percentage of positive reactions to the cutaneous test (using 20 to 100 percent tuberculin) obtained among clinically nontuberculous subjects is undeniably high, and the test is most valuable when negative. For this reason it is now advised that weaker solutions be employed for the test. The ophthalmic test is not entirely free from danger and for a time it fell into disuse, but has recently been again recommended by very competent investigators. Its greater delicacy is generally conceded, the percentage of positive reactions among nontuberculous subjects not exceeding 2 percent when a solution of from 1 to 5 percent strength is employed.

Therapeutic Use of Tuberculin.

Judgment must be used in the selection of cases for tuberculin therapy, and the patient must be under strict observation and control during the entire course of the treatment. The cardinal rule is to avoid bringing about a pronounced reaction and, if a reaction occurs in spite of careful dosage, to interrupt the treatment and when the injections are resumed, to begin again with a smaller dose than the last one injected. In this way the patient is gradually carried along until tolerance to a considerable dose is established, or, in other words, until he has developed a measure of active immunity to the toxin of the tubercle bacillus. It is ever to be borne in mind also, that the specific treatment of tuberculosis is not an exclusive or even a principal method, but an adjuvant to the classical treatment by fresh air, generous feeding, and the proper alternation of rest and suitable exercise. Local treatment, both surgical and medical, and internal medication are also to be employed, according to indications in the individual case. See TUBERCULOSIS (Pulmonary).

In *pulmonary tuberculosis* the most rigorous selection of cases must be exercised in order to achieve even a small measure of success; and to employ the treatment indiscriminately is to court disaster. As the first marked successes were obtained by the laryngologists, the ophthalmologists and the dermatologists, they give us a clue to the main indications that must be observed in the selection of pulmonary cases—namely, *localization*, and *absence of general intoxication.* The most suitable cases are those free from mixed infection; in which the temperature is normal, or at most does not rise above (37.0° C.) 100° F., in which resistance and nutrition are good, and there is a tendency to encapsulation of the pulmonary lesion. The more chronic the type of disease, whether the case be incipient or advanced, the clearer the indication for tuberculin treatment. Acute cases, incipient cases with rapid onset and active symptoms, and cases with extensive lesions or with intestinal and other severe complications, are as a rule unsuitable for tuberculin therapy, and should be treated by rest, fresh air, liberal feeding, and appropriate medication, without the specific. If, after a certain degree of improvement has been reached by these means, there is a tendency to the arrest of progress; or if a patient with early circumscribed lesions, improving under nonspecific management, suddenly shows a tendency to retrogression—and then, even if there be slight fever—the administration of tuberculin may revive the failing powers of resistance, may stimulate the organism to produce fresh antibodies, and may start the patient again on the road to recovery. In this way tuberculin sometimes proves a *valuable adjuvant* to general hygienic treatment; and when, for practical reasons, the patient cannot be given the advantages of suitable food and environment, it may even in a measure take the place of climatic change and dietetic regulation.

Contraindications.—Moderate evening pyrexia, rapid pulse, slight dyspnea, and even hemoptysis, unless severe, while calling for special care in the administration of tuberculin, do not absolutely contraindicate its use. Pregnant women may receive the treatment. But whenever the general *nutrition is poor;* when the *temperature* rarely goes below 99.5° or 100° F., and especially when the physical signs indicate *extensive softening and ulceration* of pulmonary tissue, tuberculin therapy should not be attempted. *Nephritis,* except when it can be positively shown to be tuberculous, is generally considered a contraindication. In all cases of generalized pulmonary and intestinal tuberculosis, and in the *miliary* form, the use of tuberculin is, of course, out of the question.

Gonococcus (Micrococcus Gonorrheæ).—As cultivation is difficult, stock bacterins, of which there are a number on the market, are generally employed. There is great diversity of opinion as to the efficacy of gonococcus bacterin in the various primary and secondary manifestations of this infection. It is usually said to be of undoubted value in *acute vulvovaginitis* of children, in doses of 5,000,000 also in acute, subacute, and chronic *gonorrheal arthritis* and possibly *gonorrheal exostoses.* For adults the *dose* in these conditions ranges from 50,000,000 to 1,000,000,000.

Staphylococcus Pyogenes (Micrococcus Albus, Aureus, Citreus).—Isolated from *acne vulgaris, furuncles* and *carbuncles,* superficial abscesses, sinuses and postoperative infected wounds, and *suppurative bone and gland disease complicating tuberculosis.* Either autogenous or a good polyvalent stock bacterin should be selected. The *dose* ranges from 50,000,000 to 500,000,000.

Bacillus Acnes.—Isolated from acne lesions of the *mild papular type,* in which it is said to be effective in doses of 5,000,000 to 50,000,000 bacilli. Stock bacterin can be obtained either of the acne bacillus alone or in combination with a polyvalent staphylococcus bacterin.

Streptococcus Pyogenes.—This is the most heterogeneous of all the pyogenic bacteria, which probably accounts for the general failure of antistreptococcic serum and of stock bacterins. Whenever possible, *autogenous bacterins* should be prepared. It is recommended in *localized infections* due to streptococcus pyogenes—postoperative infected wounds and sinuses, etc., also in acute and recurrent *erysipelas,* and in subacute or chronic endocarditis; *dose,* 25,000,000 to 100,000,000. The use of streptococcus bacterin in puerperal septicemia, pyemia, and acute malignant endocarditis has also been advised, but the expediency of bacterial inoculations in any acute generalized bacteremia is open to grave doubt. The *dose* in acute infections should be small, from 5,000,000 to 25,000,000.

The bacterins prepared from streptococcus and other pyogenic organisms, as well as from certain other bacteria like **streptococcus mucosus,** which are found chiefly in the conjunctival sac, have been used successfully in various suppurative conditions affecting the ocular tissues. Reference to these bacterins will be found under special headings.

Bacillus Coli Communis.—See COLON BACILLUS INFECTION.

Bacillus Typhosus.—Typhoid bacterin is useful chiefly for *prophylactic inoculation,* as the records of the English army have convincingly shown. The initial *immunizing dose* is 500,000,000, followed after ten days by a second injection of 100,000,000 and usually a third after an equal interval. The *therapeutic dose* is smaller, from 50,000,000 to 200,000,000 (acute general infection) and is recommended more particularly in relapsing cases and for the treatment of typhoid carriers.

Pneumococcus.—Special indications for the use of pneumobacterin are found in postpneumonic *empyema* after evacuation of the abscess, in *pyorrhea alveolaris* in conjunction with other bacterins, and in *corneal ulcer* (ulcus serpens corneæ). Encouraging results are reported in this ocular complication. It may be tried in any case of frank lobar pneumonia without bacteremia. Reports as to the efficacy of pneumobacterin in the treatment of the primary infection are very contradictory. The *dose* is from 25,000,000 to 100,000,000.

Other bacterins that have been used with more or less success are those prepared from **micrococcus neoformans,** a variety of staphylococcus albus found in about 90 percent of cancer cases; it sometimes does good by destroying the odor and rendering the patient more comfortable, but has no curative effect; **bacillus pyocyaneus** (puerperal sepsis); **bacillus proteus vulgaris; bacillus lactis aërogenes** (otitis media, abdominal sinuses). See SERUM THERAPY.

VAGINA, HEMORRHAGE.—Hemorrhages from the genital tract of the female are naturally divided into two classes: (1) Hemorrhages complicating pregnancy, labor, or the puerperium; (2) hemorrhages occurring in the nonpregnant woman.

1. **Hemorrhages Complicating Pregnancy, Labor, or the Puerperium.**—

A. **Hemorrhages of Pregnancy.**—

(1) Placenta prævia.
(2) Premature separation of a normally situated placenta.
(3) Rupture of varicose veins of the vagina or vulva.
(4) Apoplexy of the decidua or placenta.

B. **Hemorrhages of Labor.**—

(1) Placenta prævia.
(2) Premature separation of a normally situated placenta.
(3) Relaxation of the uterus.
(4) Lacerations of the cervix, vagina, or vulva.
(5) Rupture of the uterus.
(6) Inversion of the uterus.
(7) Hematoma of the vulva or vagina.

C. **Hemorrhages of the Puerperium.**—

(1) Retained secundines.
(2) Displaced uterus.
(3) Displaced thrombi.
(4) Fibroid tumors.
(5) Pelvic engorgement.
(6) Hypertrophied decidua.
(7) Carcinoma.

2. **Hemorrhages Occurring in the Nonpregnant Woman.**—

A. **In Virgins before the Age of Thirty.**—

(1) Uterine congestion the result of cold or exposure.
(2) Endometritis.
(3) Polypi and fibroid tumors.
(4) Retrodisplacement of the uterus.

B. **In Married Women before the Age of Thirty.**—

(1) Subinvolution.
(2) Laceration of the cervix.
(3) Endometritis.
(4) Retrodisplacements of the uterus.
(5) Polypi and fibroid tumors.

C. **In Virgins or Married Women after the Age of Thirty.**—One should always suspect, in addition to the above conditions:

(1) Carcinoma of the cervix.
(2) Carcinoma of the body of the uterus.
(3) Sarcoma of the uterus.

Hemorrhage from the female genitalia may also occur as the result of traumatism of any kind. Certain constitutional disturbances may cause it, such as purpura, scorbutus, and hemophilia.

For the differential diagnosis of the various conditions causing hemorrhage from the vaginal orifice, see under the respective headings, as CERVIX UTERI, LABOR, PLACENTA PRÆVIA, POSTPARTUM HEMORRHAGE, UTERUS (Fibroid Tumors), etc.

VAGINAL DOUCHE.—The value of the hot douche was made known by Emmet. It should be given with a gravity syringe while the patient is in a recumbent position; the more prolonged, the larger the quantity, and the higher the temperature (115° to 120° F.), the more enduring will be the effect. The ordinary fountain syringe, a large vessel with a tube leading from its lower end, or an ordinary pitcher with a rubber tube carried to and held at its bottom by a weight, may be used. Instead of the ordinary rubber, wooden, or metal nozzle, a glass end-piece is preferable, as it can be more readily cleansed. When preferred, the water may be medicated with astringents, such as alum, sulphate of zinc, acetate of lead, hydrastis, or hamamelis; or with antiseptics, as boric acid, carbolic acid (2 to 5 percent), or permanganate of potassium (1 to 2 percent), and acid sublimate (1:5000 to 1:2000) are valuable. The antiseptic injections are of especial value in vaginal discharge, more particularly when of a specific character. The advent of menstruation is considered as contraindicating irrigation, but it may be resumed before it ceases, particularly when the odor is offensive or the parts are irritated, using plain water at a temperature of 100° F. If the vaginal discharge is particularly offensive, as in malignant disease, a douche of thymol solution, 1 or 2 percent, is a most excellent deodorizer. Astringent douches are used in excessive vaginal secretion, but should not be used when the patient is wearing a pessary, as the salts are deposited upon the instrument, roughen its surface, and thus increase the irritation (Montgomery).

VAGINAL FISTULA.—Fistulous openings may exist between the bladder, the urethra, the rectum, the ureter, and the vagina.

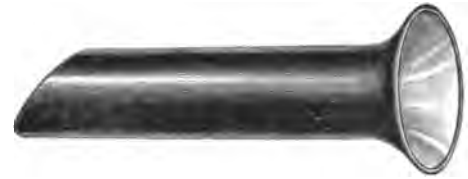
Vesicovaginal fistula is much the most frequent. It is usually the result of labor.

Symptoms.—Incontinence of urine is the first symptom. It usually appears about 6 or 8 days after labor, and is constant or not, depending upon the position of the opening. If the fistula is in the upper part of the vagina, incontinence may appear only when the bladder is distended or when the patient assumes the recumbent position.

As the result of incontinence of urine, irritation, inflammation, and sloughing of the vaginal mucous membrane may occur. The vulva and inner part of the thighs become affected, and phosphatic deposits accumulate on the skin and mucous membrane. The kidneys may become infected secondarily.

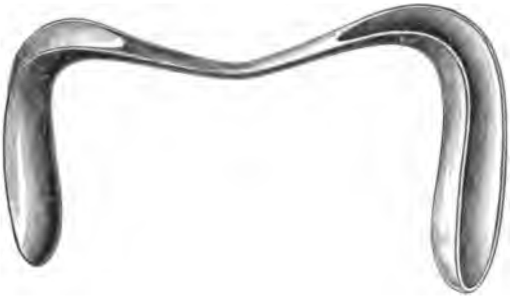
The treatment consists in closure of the fistulous opening by a plastic operation. The edges of the opening must be denuded, and then closely approximated by interrupted sutures of silkworm-gut. If the condition has existed for some time and there are inflammation, excoriation, phosphatic deposits, and contraction, preparatory treatment will be necessary. This consists of rest in bed, frequent vaginal douches of boric acid solution, applications of nitrate of silver solution to the excoriated areas, and stretching or incision of any contracting or adhesive bands that might interfere with the result of the operation.

Rectovaginal fistula is also the result of labor. The important symptom is the passage of flatus and feces into the vagina. Treatment should consist in closure of the fistulous opening by a plastic operation.



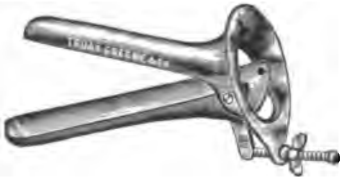
Ferguson's Speculum.

VAGINAL SPECULUM.—A vaginal speculum is an instrument through which a visual examination is made of the cervix and the vaginal walls. The instruments most commonly used are some form of bivalve speculum and the Sims duckbill speculum. They have largely supplanted the tubular (Ferguson) speculum by reason of their far wider range of application. They have the advantages of being self-retaining and of affording a much better exposure.

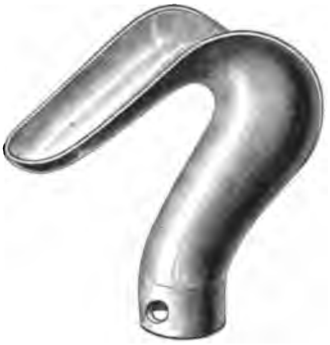


Sims' Speculum.

Popular forms of bivalve specula are those of Collins and of Goodell. The bivalve speculum is introduced with the woman in the lithotomy position; the plane of the blades held obliquely, so that the edges may correspond to the vaginal sulci. The tip of the instrument should be passed directly toward the cervix. After it has been partially introduced, the blades should be turned so that they lie transversely, and as they are separated by the thumb-screw at the handle, the cervix and the vaginal vaults come into view. This instrument can be used for inspecting the external os uteri, the cervix, and the vaginal vaults and walls; for applications to the uterus, cervix, and vagina; and for dilating and curetting the uterus.

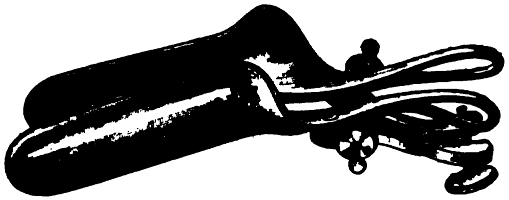


Higbee's Bivalve Speculum.

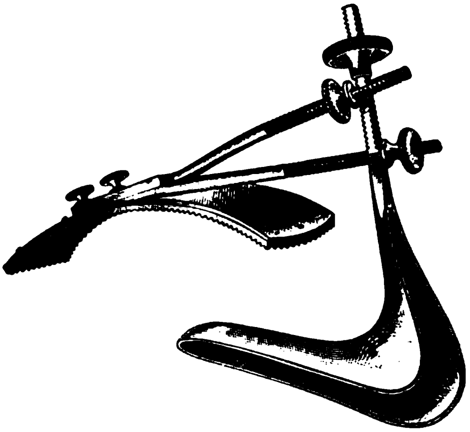


Edebohls' Speculum.

The Sims speculum may be introduced with the woman in the dorsosacral, the Sims, or the genupectoral position. In some cases the examination is facilitated by the use of an instrument for depressing the anterior vaginal wall. The Sims speculum gives the most perfect view of the cervix and vagina, and can be used advantageously in all operations upon the cervix and vagina.



Goodell's Speculum.

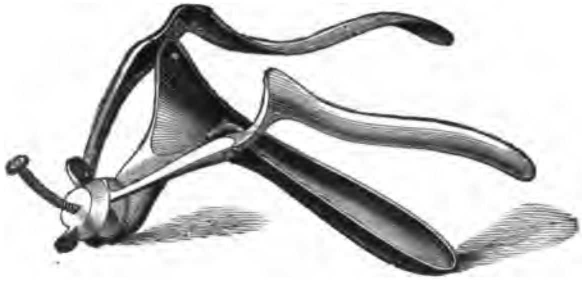


Self-retaining Sims' Speculum.

In the lithotomy position for retracting the perineum the Edebohls speculum to which a weight is attached is the most satisfactory.

VAGINISMUS.—A painful, spasmodic contraction of the muscles surrounding the lower part of the vagina and the vulva. It is caused by attempts at coitus or by digital or specular examination.

This condition is usually seen in newly married neurotic women. There is usually some exciting cause, such as a rigid hymen, a small vaginal orifice, a urethral caruncle, or an ulcer, a fissure, or some inflammatory condition around the vulva. Occasionally, it is a purely neurotic condition. It is sometimes seen in old women as a complication of kraurosis vulvæ.



Trivalve Speculum.

The treatment of this condition consists, first of all, in ascertaining its exciting cause. This, if possible, must be removed. A rigid hymen may be incised and a small vaginal orifice may be dilated. A urethral caruncle should be excised, and any inflammatory condition around the vulva should be appropriately treated.

A vaginal suppository containing 1/2 grain of cocain, introduced 15 minutes before intercourse, will sometimes prove effective. Gradual or forcible dilatation of the vagina will occasionally give relief.

In the gravest cases it will be necessary to make incisions in the direction of the posterior vaginal sulci. These incisions should be deep enough to divide the underlying muscles and fasciæ; and to prevent retraction a glass vaginal plug should be worn for a few days. When the condition is a purely neurotic one, constitutional remedies should be employed.

VAGINITIS.—Inflammation of the vagina, or vaginitis, is usually secondary to some other condition, such as vulvitis, endometritis, or a fistula of the bladder or rectum. Occurring as a primary condition, it is usually due to gonorrhea. Four varieties of vaginitis have been described—simple, granular, senile, and emphysematous.

The symptoms of vaginitis are pain and a sense of fulness in the pelvis—which are increased by walking or movement of any kind—and a purulent discharge. As the disease becomes chronic it tends to localize itself particularly to areas about the ostium and vaults.

The treatment in the acute stage consists of rest in bed and mild purgation, and in the employment of vaginal douches. The douches should consist of a gallon of hot boric acid solution (1 dram to 1 pint) every 2 or 3 hours. After the acute symptoms have subsided, douches should be given every 3 hours of potassium permanganate (1:4000), or bichlorid of mercury (1:4000). After 2 weeks the douches may be given 4 times a day of double the strength. In chronic cases after the subsidence of acute symptoms, astringent douches are employed, *e. g.*, zinc sulphate (1/2 dram) and powdered alum (1 dram) added to a quart of water, or potassium permanganate (1:2000) or argyrol solution 25 to 50 percent. The vaginal walls are cleansed and painted with nitrate of silver solution (1 dram to 1 ounce) and boroglycerid tampons are inserted. Tampons of ichthyol in lanolin (1:4) are valuable. Treatment should be continued until all evidence of the disease has disappeared.

VAGUS NERVE.—See Pneumogastric Nerve.

VALERIAN.—The dried rhizome and roots of *Valeriana officinalis.* It contains a *volatile oil,* from which are developed by oxidation *valerene,* $C_{10}H_{16}$, a terpene; *valerol* or Baldrian Camphor, $C_{12}H_{20}O$; and *valeric acid,* $C_5H_{10}O_2$, which occurs also in many other plants and in cod-liver oil. The valeric acid of pharmacy is obtained as a product of the oxidation of amylic alcohol, and from it are formed the various valerates. It is not therapeutically identical with the natural acid. Dose of the powdered root, 10 to 45 grains. It is antispasmodic and is gently stimulant to the nervous system and the organs of circulation. In full doses it increases heart action, producing exhilaration; in toxic doses, diarrhea, vomiting, reduced sensibility, and mental disturbance. It is excellent in hysteria, in convulsions due to worms, in the coma of typhus fever, and in whooping-cough.

Preparations.—**V., Flext.** Dose, 10 to 45 minims. **V., Tinct.,** 20 percent. Dose, 1/2 to 2 drams. **V., Tinct., Ammoniat.,** valerian 20, aromatic spirit of ammonia enough to make 100 parts. Dose, 5 to 45 minims. **V., Ol.,** the volatile oil (unofficial). Dose, 1 to 5 minims. The oil is the best preparation to use, as the tinctures are extremely nauseous, and the fluidextract is too bulky.

VALGUS.—See Talipes Valgus.

VALIDOL.—The menthol-ester of valeric acid containing 30 percent of free menthol. A carminative and antihysteric, combining the activites of its components. It is said to produce no gastric irritation and is recommended in hysteria and sea-sickness and the vomiting of pregnancy Dose, 10 to 15 drops on sugar.

VALVULAR DISEASE.—See Heart-disease (Organic).

VALYL.—Valeryldiethylamid. A compound of valeric acid and diethylamin. It is a sedative, nervine, antispasmodic, similar to valerian. Dose, 2 or 3 gelatin capsules, each containing 2 grains.

VANILLA.—The fruit of *V. planifolia,* an orchid found in tropical America, and of other species of the genus. Its odor is due to a methyl-ether, *vanillin.* It is an aromatic stimulant, sometimes employed in hysteria and low fevers, but it is used chiefly as a flavor. **V., Tinct.,** 10 percent. Dose, a few drops, according to the flavor desired. **Vanillin**, $C_8H_8O_3$, crystallizes in stellate groups of colorless needles, is soluble in hot water, alcohol, and ether. It has a warm, aromatic taste. Commercial vanillin is in part prepared from the inner bark of white pine and from eugenol. Dose, 1/4 to 1 grain.

VAPOR BATH.—The application for therapeutic purposes of steam (medicated or otherwise), or of some other vapor, to the surface of the body, in a suitable apartment or apparatus. See Bath.

VARICELLA (Chicken-pox).—Varicella is an acute contagious disease, characterized by a cutaneous eruption of papules, vesicles, and occasionally, pustules; by mild constitutional symptoms, and by the absence, as a rule, of complications and sequels.

Etiology.—The specific poison has not been isolated, but it has been proved that the contagium of the disease is found in the vesicles. Varicella is directly very contagious, and it may, in rare cases, be carried by a third person. Children of any age may be affected by it, but one attack gives immunity. The period of incubation is from 14 to 16 days.

Symptoms.—In many cases the eruption is the first symptom, though there may be noticed slight fever and general indisposition for 24 hours preceding it. The eruption consists of first a macule and then a papule, but these so rapidly become vesicular that the vesicle is usually the first lesion noticed. The vesicle is tense transparent or slightly yellow, and is about the size of a split pea. The eruption appears first upon the upper part of the body and upon the neck, scalp, and face. Usually, the face escapes with a few lesions, but the hairy scalp contains quite a number.

The vesicles frequently form on the mucous surface of the lips, mouth, throat, conjunctiva, and progenital region; and when occurring on these parts, bear a characteristic appearance, owing to the fact that they quickly lose their delicate covering, and then resemble aphthous ulcers with a well-marked red zone around them.

The eruption appears in successive crops, and different stages are found at the same time and in close proximity. The eruption begins to disappear in a few days after its appearance. Some of the vesicles become flaccid or slightly umbilicated from the absorption of their contents, and others rupture, either spontaneously or from scratching. They finally dry up and the crusts drop off, leaving small circular marks, which soon disappear. In cases in which the vesicles have become infected or in which they are very deep, permanent scars or pits remain.

Pustules may develop in consequence of irritation or infection, or in feeble or poorly nourished children. In rare cases there may be necrotic inflammation around the site of the pock, a condition to which is given the name **varicella gangrænosa.**

In mild cases about a dozen vesicles may appear upon the body; but when severe, the skin may be covered in certain regions. In mild, uncomplicated cases the temperature reaches 101° to 102° F., and lasts only two or three days, being highest when the eruption is appearing and falling gradually as it fades. There are no characteristic constitutional symptoms, but there is present more or less severe indisposition, as found associated with any febrile disease, the child frequently not being ill enough to remain in bed.

Complications.—Erysipelas may occur from infection by the vesicle, and acts as a serious complication. Mild adenitis is occasionally seen. Nephritis may occur, but it is rare as a result of varicella. The other infectious diseases of childhood (measles, scarlet fever, etc.) quite frequently occur just before, at the same time, or closely following chicken-pox, and when present at the same time, render the diagnosis in some cases very difficult.

Diagnosis.—As a rule, the diagnosis of varicella offers no special difficulty. The fact that the eruption appears in crops, so that papules, vesicles, and crusts are seen in close proximity; that the vesicles are unilocular; and that they are never confluent, serve to distinguish it from other eruptive affections. In certain cases, however, it is difficult, if not impossible, to distinguish this disease from a mild form of variola. The following table will aid in the diagnosis:

	VARICELLA.	VARIOLA.
Incubation,	Two weeks	One to two weeks.
Prodromes,	None, or slight	Three or four days in duration; active; severe.
Efflorescence,	On the skin; rapidly becomes vesicular; not umbilicated; unilocular; irregular; numerous; universally distributed in successive crops; vesicles differ greatly in size; on pricking, collapse entirely.	Under the skin; a slow progressive development from a macule to a papule, to an umbilicated vesicle, to a pustule; multilocular; regular; not numerous; defined in its localisation; lesions, as a rule, of uniform size; on pricking, collapse partially.
Desquamation,	Slight crust formation.	Pronounced crust formation.
Duration,	Short; 1 week to 10 days.	Long; 3 to 4 weeks.
Type,	Mild	Severe.
Temperature,	Irregular; not high	Rises suddenly; remains high until papules are developed, when it falls considerably; rises again during development of the pustules.

Prognosis.—The prognosis is invariably good, except when the disease occurs in weak and debilitated children whose hygienic surroundings and care are faulty.

Treatment.—Isolation should be enforced in schools and institutions containing many young children. In homes, unless the younger children are delicate, quarantine is unnecessary. In most cases the constitutional symptoms are so mild as to require no treatment. It is best at the outset to place the child in bed for a few days and to sponge daily with warm, carbolized water, applying carbolized vaselin to the vesicles to allay the itching. Later, when the crusts have formed, the following ointment is useful:

Apply locally:

℞.	Carbolic acid,	♏ xv
	Boric acid,	ʒ jss
	Glycerin,	ʒ iij
	Rose-water,	℥ j
	Water, enough to make	℥ iv.

Apply to affected parts once daily.

Or:

℞.	Carbolic acid,	♏ v
	Ichthyol,	ʒ jss
	Vaselin, enough to make	℥ j.

Apply on soft cloth once daily.

℞.	Ichthyol,	gr. x
	Zinc ointment,	℥ j.

A light diet, of milk, soups, and eggs. If the tongue is coated, calomel (1/8 grain) may be given every 1 1/2 hours until 4 or 5 doses have been taken.

Care should be taken to keep the skin clean and to prevent scratching. In all cases the urine should invariably be examined several times during and following the attack. Quarantine should be instituted for 2 weeks.

VARICOCELE.—Dilated and varicose condition of the spermatic veins.

The causes of varicocele are not definitely known. It has been attributed to an abnormally lax state of the parts, induced by debility and general want of tone; to congestion from too early or continual excitement of the sexual organs; to occupations involving prolonged standing; and to certain anatomic peculiarities (all of which, however, are present in every healthy male) such as the great length of the spermatic veins, the dependent position of the testicle, the plexiform arrangement of the veins in the scrotum, etc. But it often occurs in men in good health, and in whom the parts are not lax. The reasons given for its much greater frequency on the left than on the right side are: (1) that the left vein is longer than the right; (2) that an obstacle is offered to the outlet of the left vein by its opening at right angles into the renal vein; (3) that the blood-pressure is less in the vena cava than in the renal vein; (4) that the left vein is crossed by the sigmoid flexure, and is hence liable to be pressed upon by fecal accumulations. Spencer believes that the presence of the large veins is due to a congenital variation from the normal process of development, whereby many of the veins of the wolffian body (from which the spermatic veins are formed) remain unobliterated, and capable of being dilated by anything obstructing the return of venous blood from the testicle. More of these veins, he says, are normally obliterated on the right than on the left side.

Symptoms and Diagnosis.—There may be merely a sense of weight and fulness in the scrotum, or dragging or even severe pain, worse after the day's work, but relieved by recumbency. The symptoms, however, are often more mental than physical, the patient fearing impotence or sterility, and sometimes becoming hypochondriacal in consequence. The varicose veins, which may sometimes be seen through the skin of the scrotum, form a soft, irregular, opaque, knotted, pyriform mass, in which there is a distinct expansile thrill or impulse on cough. The swelling is confined to the scrotum, and although it may be reduced on the patient's lying down, it does not go back with a gurgle or slip like a hernia, and gradually returns when the patient rises, notwithstanding that the finger is placed over the external abdominal ring. The testicle, though perhaps, as a rule, a little smaller than natural, is seldom much atrophied.

Treatment.—In the vast majority radical measures are entirely out of place; varicocele seldom causes inconvenience after early manhood is past. A suspensory bandage should be worn, one that is not too warm or too complicated; the parts should be bathed with cold water night and morning; the bowels should be opened regularly; a fair amount of exercise should be taken; and stimulants, sexual excitement, etc., should be avoided. It is only when the health is impaired that the weight of the part is noticed. Occasionally, however, this is not sufficient; the patient may wish to enter the Government service; both sides may be involved; the varicocele may be serious from its size, the rapidity of its enlargement, or the danger of rupture or phlebitis (which is not uncommon in connection with gout); the testis may be irritable and tender, or the patient very much troubled about its condition. In those cases in which there is any reason to fear the development of hypochondriasis, every endeavor must be made to divert the patient's attention from the disorder; but too often the attempt ends in complete failure, and, though the prospect is not an inviting one, there is no alternative. Pearce Gould considers operation advisable in all cases in which varicocele develops before puberty.

Operation.—The older method, in which a ligature was passed around the veins subcutaneously in one or more places, is practically abandoned: the result is uncertain, and there is great risk of transfixing a vessel. Even the addition of subcutaneous section does not increase the security. The method ordinarily adopted is to expose the veins freely, so that the structures to be dealt with can be seen; isolate the vas deferens with the spermatic artery, ligate the vessels above and below, and excise the intermediate portion. Pearce Gould, however, considers subcutaneous section with the cautery preferable.

The patient is placed under an anesthetic, the parts are shaved and cleansed, and an incision of sufficient length is made along the cord, exposing the fascia that surrounds the veins. The vas is then carefully separated at the back, taking care not to isolate it, but to leave the fascia around it untouched; a catgut ligature is passed around the rest of the fascia and the veins above, a second ligature below, and the intervening portion is excised. Practically, if the separation is commenced above, all the veins are included but one or two little ones with the vas. The length to be excised depends, as Bennett has shown, upon the height to which it is wished to raise the testicle; and after excision the two cut ends should be sutured together, so that the shortening of the fascia may help to support the gland. No drainage-tube is needed, unless there has been much handling. The swelling afterward is considerable, and the testis may be a little tender, but orchitis does not follow. An ice-bag may be applied for 48 hours as a precaution. The patient should remain in bed for 10 days or 2 weeks, by which time the induration will have disappeared, and should wear a suspensory bandage for some months (Moullin).

VARICOSE VEINS.—A vein is said to be varicose when it is permanently and unequally dilated, and when its coats have undergone certain degenerative changes. A varicose condition is most common in the veins of the lower extremities and in the veins of the rectum and testicle. See HEMORRHOIDS, VARICOCELE.

The **causes** may be considered under the heads of increased intravenous pressure and changes in the vein-walls.

Increased intravenous pressure may be due to: (1) Organic affections of the heart whereby the return of venous blood is impeded. (2) Obstruction to the circulation in the portal system, a cause chiefly affecting the hemorrhoidal veins. See HEMORRHOIDS. (3) Pressure upon the veins, such as may be exerted (*a*) by the gravid uterus or by a tumor of the uterus or of the ovaries on the iliac veins; (*b*) by an aneurysm of the abdominal aorta on the inferior vena cava; (*c*) by fecal accumulation on the hemorrhoidal veins; (*d*) by a tumor in the groin on the femoral vein; (*e*) by an ill-fitting truss on the spermatic veins (see VARICOCELE); or (*f*) by a tight garter on the saphenous veins. (4) Prolonged standing, which has a tendency to cause the accumulation of blood in the veins of the lower extremity. (5) Severe muscular exertion, whereby an increased amount of blood is driven by the contraction of the muscles from the deep into the superficial veins.

Some authors consider this last the chief, if not the only, cause of varicose veins of the lower extremities. They maintain that the pressure of the blood first produces a dilatation of the superficial veins where the intermuscular veins empty into them; that this dilatation, being frequently repeated, becomes permanent; that the valves, in consequence, are unable to close and protect the veins, and, being thrown out of use, gradually undergo atrophy, while the weight of the column of blood, from the inefficiency of the valves, becomes further increased and the veins are still further dilated.

Changes in the Vein-walls.—These consist principally of a hereditary weakness, a want of muscular tone, and an inflammatory softening of the walls. Varicose veins are more common in men than in women, owing to their more frequent exposure to the exciting causes. Women, however, are peculiarly liable to them during pregnancy.

The **symptoms** usually complained of are fatigue and a sense of fulness of the limb after exercise or prolonged standing, and perhaps cramp, coldness of the feet, swelling and edema of the ankle, and numbness of the leg. Sometimes there is deep-seated pain. The tortuous vein or veins meandering up the leg is a characteristic sign, and cannot be mistaken. When the smaller radicals are affected, bluish clusters of minute veins are visible here and there, especially about the ankle and knee.

Treatment is palliative and radical.

Palliative.—All obstructions must be removed, as far as possible. Tight garters are exceedingly injurious. In pregnancy the patient must rest as much as possible, or as much as is consistent with health, and should wear a bandage or an elastic stocking both during and for some time afterward. The bowels must be kept well open, and prolonged standing and excessive walking should be avoided, although a reasonable amount of exercise, avoiding fatigue, is decidedly beneficial.

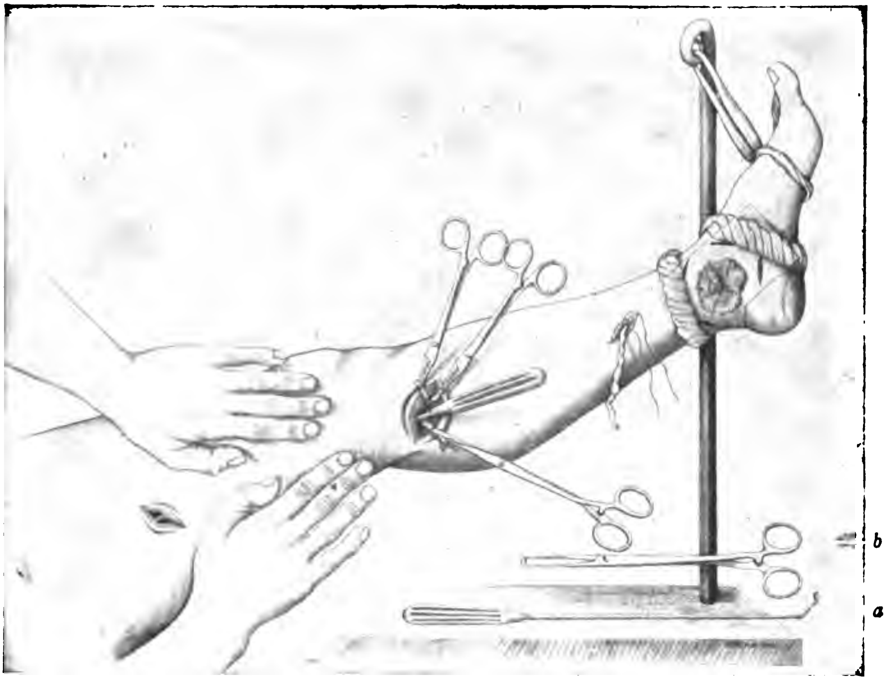
If the varix has made its appearance suddenly after exertion, the walls of the vein must be carefully protected from strain for some considerable time. The limb should be kept at rest in the horizontal position, for 2 or 3 weeks, according to the size of the vein, and then carefully supported.

In the majority of cases all that can be done is to caution the patient against the evil effects of standing, etc.; to maintain the general health by means of tonics, combined with good food, fresh air, and a fair amount of exercise; and to supply some kind of support. Silk anklets, elastic stockings, and the appliances generally in use serve the purpose for which they are intended very ill; they produce the maximum of constriction when first applied, and then each week relax more and more until replaced; they are usually much too tight, and generally cause considerable wasting of the muscles. If worn once, the limb becomes so used to their pressure that the patient can hardly be induced to leave them off. Bandages of thin flannel, domet, or perforated rubber are much better, as they can be put on with just sufficient pressure and no more, instead of an iron rule being followed in all cases alike. Upward friction and massage should be practised every night when the appliance is removed. If bleeding threatens, the part should be well bandaged and kept at rest; if it breaks out (the usual situation is the lower third of the leg), the limb must be raised at once. The hemorrhage is exceedingly profuse, but it comes from the proximal or cardiac end, and raising the limb stops it instantly. If inflammation sets in and the veins become hard and painful, showing that they are filled with clots, the patient should be confined to bed and the limb should be placed in a slanting position on a leg-rest and covered with lead lotion.

Radical.—In a certain number of cases the radical cure may be tried. As a rule, it is only advisable when the superficial veins are concerned.

and when the part involved is limited in extent. Sometimes, however, it is beneficial in cases of varicose ulcer, in which the persistence of the sore appears to be dependent upon the vein. The choice lies between acupressure (with or without subcutaneous division), ligation, and excision.

Acupressure.—This is performed by passing a flat needle beneath the vein, while it is pinched up with the finger and thumb, and then twisting a figure-of-eight suture over the ends, protecting the skin beneath by means of a piece of bougie or quill. The needles should be about 3/4 of an inch apart, and the vein may be divided subcutaneously between them with a tenotomy knife. They should not be left in for more than a week, and if any inflammation occurs, the time should be shortened. Failure is not infrequent, and there is always the risk of transfixing the vein.



Mayo's Operation.

Ligation.—A small incision is made over the vessel and an aneurysm needle is passed around it and threaded with catgut. The ligature left when the needle is withdrawn is tied and the ends cut short. This method may be combined with the former, ligatures being placed in the intervals between the pins. Subcutaneous ligation may be tried in suitable cases.

Excision.—This is by far the most effective method. The skin over the vein is reflected, the incision being as far as possible longitudinal; the vessel is carefully isolated from the surrounding tissue, a double ligature (catgut) is placed around it at each end and around each branch, and the whole intervening portion is excised.

C. H. Mayo excises the long saphenous vein in the following manner: the vein exposed and isolated near the saphenous opening and divided between ligatures and the peripheral portion grasped with a hemostat. The vein is passed through the loop of Mayo's dissector. Guided by the vein the dissector is pushed under the skin down to a point near the knee. The skin is incised over the end of the dissector. The vein clamped, pulled out through the wound, ligated and the loose portion excised. If the dissector is obstructed in its work by adhesions around the vein, the closed forceps is passed alongside it and when the adhesions are reached the blades of the forceps are slightly opened. In the same manner as many other veins are removed as may be necessary. The dissection is made from above downward to avoid the danger of detaching thrombi and throwing them into the circulation.

Schede's operation consists in making an incision completely around the leg down to the deep fascia and doubly ligating all the divided veins.

VARIOLA.—See Small-pox.

VARIOLOID.—See Small-pox.

VASELIN.—See Petrolatum.

VASOCONSTRICTORS.—Drugs that increase the contractile power of the vessels, lessening the circulation therein and raising the blood-pressure; hence they are used to check hemorrhage and cut short inflammations. The principal agents are: Adrenal extract, adrenalin, antipyrin, cotarnin, hydrastinin, strychnin, hamamelis, atropin (small doses), opium (small doses), cocain, ergot, digitalis, squill, strophanthus, iron, camphor, sulphuric acid, barium salts, lead salts, silver salts, zinc salts, cold (locally).

These agents act upon the local vasomotor mechanism in the walls of the vessels, hamamelis affecting the venous system especially. Cold is one of the most powerful agents of this class, and is also a cardiac sedative. Adrenal extract produces an enormous rise of the blood-pressure, due to its extraordinary contractile power over the muscular fibers in the walls of the arterioles. Adrenalin is said to be 625 times more powerful in this respect than the extract. Digitalis, squill, and strophanthus, in small doses contract the vessels, but in large doses dilate them.

VASODILATORS.—Drugs that produce dilatation of the peripheral vessels, and increase the rapidity of the circulation, thus equalizing the blood-pressure and relieving internal congestions. The most useful are alcohol and ether, as they stimulate the action of the heart simultaneously with the vascular relaxation. The chief are: Alcohol, ether, nitrous ether, nitroglycerin, amyl nitrite, potassium nitrite, sodium nitrite, erythrol tetranitrate, belladonna (at last), stramonium (at last), hyoscyamus (at last), opium (full doses), ipecacuanha, Dover's powder, thyroid extract, chloral, chloroform, ammonium acetate, tartar emetic, hydrocyanic acid, aconite (?), heat (at first).

The nitrites are our most certain, in fact almost our only certain remedies to dilate the blood-vessels (Wood). The dilating action of amyl nitrite and other nitrites is due either to weakening of the muscular walls of the arterioles or to paralysis of the vasomotor terminals therein. Alcohol, ether and opium probably depress the vasomotor center. Aconite does not affect the vasomotor center of the vasomotor nerves, hence the lessened arterial tension induced by it is due to its depressant action on the heart alone (Ringer). Atropin and its congeners act on the vessels differently in different doses, and at different stages in its action.

Vasodilators are often called vascular stimulants or stimulants of the circulation; but there is this difficulty of speaking of stimulants or sedatives of the circulation, that if both the heart and the vessels are stimulated at the same time, the action of the one tends to counteract that of the other. On the other hand, a drug which weakens the heart may increase the circulation by dilating the vessels, thus acting as a vascular stimulant (Brunton).

VEINS, INFLAMMATION (Phlebitis).—Phlebitis, or inflammation of veins, may be divided into the simple and the septic or spreading.

Simple phlebitis, formerly known as **adhesive phlebitis,** is a simple local inflammation of the vein-wall, and may terminate in resolution, in obliteration of the vein, or, more rarely in the formation of a localized abscess.

Causes.—(1) Injury of the vein-walls; (2) simple inflammation of the surrounding tissues; (3) the formation of a noninfective thrombus in a vein; (4) gout or the gouty diathesis; (5) certain conditions of the system the exact nature of which is not known, the phlebitis being then spoken of as idiopathic.

Symptoms.—When the vein is superficial, it can be felt as a hard, knotted cord, standing out under the skin and surrounded by inflamed cellular tissue. It is exceedingly tender to the touch, but, unless the periphlebitis is very acute, and the vein is quite under the surface (as in the case of a varicose internal saphena), the skin is seldom much reddened. There is often a very considerable degree of pain and stiffness, especially on movement, or when the limb is allowed to hang down; and sometimes there is profound constitutional disturbance. In the case of the deeper veins the diagnosis chiefly rests upon the deep-seated hardness and tenderness, the peculiarly clumsy appearance of the part, the sense of weight and pain when the limb is allowed to hang down, the relief as soon as it is raised, and the evident distention of the more superficial vessels. Generally, a certain amount of superficial edema can be detected on the distal side of the obstruction: around the malleoli, for example, in cases of phlebitis of the deep veins of the leg.

Gouty, rheumatic, and syphilitic phlebitis can only be distinguished by the other symptoms that accompany these disorders; they have no certain distinctive character of their own, although the gouty variety is occasionally metastatic. They all have a decided tendency to symmetry, they affect the superficial veins rather than the deep ones and the lower limbs much more frequently than the upper. Recurrence is exceedingly common in the gouty variety, and may continue in the syphilitic form all through the secondary period, but it is seldom that permanent obliteration is caused by either gout or syphilis.

Treatment.—Rest is absolutely essential until at least all trace of inflammation and tenderness has disappeared. Serious extension of the thrombus and detachment of outlying fragments, causing embolism, are rare accidents, considering the very large number of cases of phlebitis of varicose veins of the leg; but they do happen occasionally, and every precaution must be taken to avoid them.

Elevation is no less essential, for the sake of the return circulation and to relieve tension. Cold lead lotion, as a rule, causes the inflammation to subside within a few days; but in cases of gout, and when the arteries are atheromatous, belladonna (equal parts of the extract and glycerin) and warmth should be used instead. The bowels should be kept well open; the diet should be light, without stimulants, and if there is any evidence of gout, rheumatism, or syphilis, appropriate remedies should be employed. Afterward, when all the inflammation has subsided, the patient may be allowed to go about with a support; if the leg is much wasted, or has a tendency to remain cold or edematous, massage may be used to improve the circulation.

Suppurative Phlebitis.—This, too, may originate either as a periphlebitis or in the interior. Examples of the former are often seen in diffuse inflammation of the cellular tissue; the pyogenic organisms rapidly destroy the coats of the veins, spreading along the loose cellular tissue around them, and causing them to slough or to melt away into the purulent fluid that fills up every interstice. As the endothelium is approached coagulation takes place, and although the thrombus shares the fate of all the rest of the structures, fortunately, in the vast majority of cases, the coagulation extends sufficiently far and with enough rapidity to act as a barrier and to prevent the poison from spreading far and wide in the circulation. If it fails, or if it is broken down, general pyemia is almost certain. This is of common occurrence in acute suppurative osteomyelitis and in otitis media, infective inflammation, with thrombosis, spreading along the coats of the veins into larger and larger trunks, until at length the puriform clot that fills the vessel gives way and is scattered all over the body, causing metastatic abscesses wherever it enters.

Acute spreading phlebitis of the same character, and ending in embolic pyemia in the same way, may begin in the interior of a vein as well as around it. This, of course, unless pyemia has already developed, can only take place after the cavity of the vein has been opened. Usually, under these circumstances, the vessel either collapses at once or a coagulum forms and extends up to the next set of valves or to the next larger branch. If, however, septic decomposition sets in before organization has taken place, and lends its aid to the micrococci of suppuration, the clot melts away at once into an infective puriform fluid, and there is every chance of a wide-spread distribution of infective emboli all over the body, even before the rest of the tissues succumb or before the diffuse cellulitis assumes alarming proportions (Moullin).

VEINS, INJURIES.—**Rupture** or subcutaneous laceration of a vein occasionally occurs from causes similar to those producing rupture of an artery—an accident, moreover, with which it is frequently associated. When the vein is of large size, much blood may be extravasated into the tissues, and may produce gangrene by pressure on the vessels carrying on the collateral circulation, though such a result is much less common than after rupture of an artery. The blood, except when the extravasation is large, is usually absorbed, but it may break down and suppuration ensue.

Wounds.—Punctured and incised wounds, when small and parallel to the long axis of even large veins, readily heal by adhesive inflammation without obliteration of the lumen of the vessel. At times, however, a clot may form in the wound, and successive layers may be deposited upon it until untimately the vein is occluded. When a vein is completely cut across, as in amputation, it usually collapses as far as the next pair of valves, a clot forms as high as the first collateral branch, and the vein becomes permanently occluded. In consequence, however, of the vein-wall containing less elastic and muscular tissue than an artery, bleeding sometimes continues unless stopped artificially.

Treatment.—When the wound is a mere puncture in the continuity of the vein, unless it is found that pressure will control the hemorrhage, the coats should be nipped up by forceps and a lateral ligature applied. If a vein continues to bleed during an amputation, it should be tied like an artery. A large wound, or one made in the longitudinal axis of a large vein, necessitates ligation of the vein in two places, and the division of the vessel between the two ligatures. See ARTERIES (Injuries).

The dangers of wounds of veins are: (1) Hemorrhage; (2) inflammation of a septic character, and the attendant risks of blood-poisoning from the detachment of the infected clots; (3) entrance of air.

Entrance of air into veins is fortunately a rare accident. It sometimes happens in operations about the root of the neck, where the disposition of the cervical fascia prevents the veins collapsing and thus allows air to be sucked in during inspiration. Air is known to have entered a vein by the hissing sound during inspiration, the escape of frothy blood from the vein on expiration, the urgent dyspnea, and the state of collapse into which the patient immediately falls. On listening over the heart a peculiar churning sound can be heard. Death in fatal cases usually occurs in a few minutes, and is due to the admixture of blood and air preventing the circulation through the capillaries of the lungs, and so causing distention and paralysis of the right side of the heart.

Treatment.—The finger should at once be placed over the hole in the vein to prevent more air entering, and a clamp or ligature should be applied as soon as practicable. Pouring water into the wound has been suggested both as a means of preventing the further entrance of air during inspiration, and of allowing that which is already in to bubble out during expiration. The patient should be placed with his head low to insure a sufficient supply of blood to the brain, and for the same purpose the arteries of the extremities should be compressed, while injections of ether or of brandy should be given subcutaneously to stimulate the heart Artificial respiration should not be performed until the vein is secured, lest more air be sucked in. To guard against the accident the veins should be clamped before division, and in removing a tumor traction should not be made at the moment the vein is severed (Walsham).

VEINS, VARICOSE.—See VARICOSE VEINS.

VENEREAL DISEASES.—See SYPHILIS, CHANCROID, GONORRHEA.

VENESECTION (Phlebotomy).—Venesection, though not so often employed in modern surgery as in ancient days, has been considerably discussed lately, and is again coming into use. It is at times most beneficial in very acute inflammations in young and plethoric subjects.

The blood may be taken from one of the veins of the arm—usually from the median basilic vein, as that is the larger vessel—or from the external jugular vein. In bleeding from a vein of the arm, a bandage or tape is carried twice around the arm a little above the elbow, to obstruct the vein, and is tied in a bow. Grasping the arm with the left hand, with the thumb steadying the vein, the surgeon makes an incision into the vessel, holding the lancet with the blade between his forefinger and thumb, about 1/2 of an inch from the point, to prevent it penetrating too deeply. The blood is directed into a graduated bleeding-bowl, the flow, if necessary, being increased by having the patient firmly grasp a stick. When sufficient blood has been taken (usually about 10 ounces) the constricting tape is untied, a pad is placed over the incision, and the ends of the tape are carried across the pad to below the joint, then around the arm, and again over the pad, where theyare tied.

Uses.—Sanquirico has established that within certain limits venesection never produces functional alterations or disturbances in the nutrition in animals. Maragliano has reported a number of tests and experiments demonstrating that impoverishing the blood has no injurious effect upon the evolution of infective diseases, but is even directly beneficial when the lungs are not working properly and are unable to eliminate the excess of carbonic acid formed in a blood particularly rich in red corpuscles. Traube expressed this fact when he stated that persons whose blood contains fewer red corpuscles than the average are less affected by pulmonary disturbances than others, and that even a small amount of lung surface is sufficient to eliminate their carbonic acid. This fact explains the manifest improvement after venesection in pneumonia, which he has observed again and again in his own practice; the dyspnea and cyanosis decrease, while the elimination of carbonic acid increases. On the other hand, in cases of circumscribed pulmonary lesions the elimination of carbonic acid decreases after venesection, showing that the elimination had been practically normal. Recent research (Robin) has proved that venesection promotes oxidation processes in pneumonia, and everything tends to the assumption that when the corpuscles are inert, they are useless. Maragliano agrees with Zakharine that venesection is especially beneficial in active congestions with hemorrhage, especially hemorrhage of the respiratory apparatus and brain. The amount necessary to obtain the mechanic effect required in these cases is from 200 to 400 c.c. Zakharine even ascribes a revulsive action to phlebotomy, claiming that the congestion may be drawn to a remote vascular region; and Calabrese adds two corroboratory observations of severe, rebellious hemoptysis in tuberculosis, arrested by a few leeches applied to the base of the thorax.

Maragliano has dwelt upon the advantages of venesection in eliminating the toxins circulating in the blood, especially in renal or pulmonary insufficiency, or when there is some obstacle to the passage of bile into the intestines, and also in the autointoxications resulting, usually, from the suppression or functional alteration of the organs designed for the defense of the organism against the poisons it manufactures spontaneously. Bouchard has demonstrated that 500 grams of blood taken from a uremic subject contain 8 grams of extractive matters: *i. e.*, about the same amount as is eliminated normally by the kidneys during 24 hours. The attempt has been made in cerebrospinal meningitis to clear the blood by venesection of all the toxic substances accumulating in it; and favorable results have been obtained with venesection, combined with the injection of salt solution, in diplococcic toxemia, especially in regard to the complicating hyposystolic phenomena, although these facts are not yet fully established. In uremic intoxication, an amount varying from 500 to 1000 c.c. is withdrawn. The simultaneous injection of salt solution allows greater quantities of blood to be withdrawn. See INFUSION OF SALINE SOLUTIONS.

Baccelli reports that he has seen most remarkable results follow venesection, especially in capillary bronchitis and acute nephritis. He explains its action in the latter case by the fact that the peripheral pressure of the effusion in inflammation of Bowman's capsule compresses the small blood-vessels and retards the circulation through the delicate apparatus of the glomerulus, from which the entire functional economy of the kidney suffers; the epithelium undergoes fatty degeneration, and the urine diminishes in quantity, with symptoms of progressively increasing toxemia. He has saved and even secured complete regeneration of the kidney in many cases of this nature by opening a vein in the foot.

VENOM.—See BITES AND STINGS (Snake-bites).

VENOUS INFUSION.—See INFUSION OF SALINE SOLUTIONS.

VENOUS INJECTION.—See INTRAVENOUS INJECTION.

VENTILATION.—The dilution and removal of all impurities that collect in the air of inhabited rooms, the most common of which is CO_2, the presence of which may be tested for by **Lange's method.** It consists of shaking, in a bottle full of the air to be tested, 1/2 of an ounce of clear fresh lime-water. If the air contains 7 parts to 1000 of CO_2, a turbidity of the fluid will occur.

In hospitals the **fundamental principle of ventilation** observed is that each adult person confined in a space of 1000 cubic feet requires 3000 cubic feet of fresh air an hour in order to prevent the proportion of carbon dioxid in the room from rising above 0.06 percent. This estimate is based on the fact that each adult expires, on the average, 0.6 of a cubic foot of carbon dioxid an hour.

Ventilation may be *natural*, due to the forces constantly acting in nature, or *artificial*, the result of measures introduced by man. The former is brought about by the agency of the wind and by diffusion, or the power that gases of different densities possess of mixing with one another.

Artificial ventilation is brought about either by extracting the foul air from the room, or by forcing pure air into the room, and is affected by means of fans, heat, gas, or steam.

Natural ventilation is aided by means of tubes or shafts employed as inlets and outlets. The outlets are guarded by cowls, which prevent the entrance of rain, increase the extracting effect of the wind, and check the tendency to down-draft. A most valuable agent in this ventilation is the chimney. Windows also may be utilized for the same purpose.

The estimation of CO_2 in the air may be made by the following methods:

1. *Minimetric method,* when the proportion of CO_2 is not less than 1 part to 1000. The analysis is made by the use of a solution of sodium carbonate with phenolphthalein as an indicator.

2. *Pettenkofer's method* has for its basis the fact that if air containing CO_2 is brought into contact with barium hydroxid in solution, a combination takes place between the barium and CO_2 immediately, and insoluble barium carbonate is precipitated.

3. *Szydlowski's method* consists in comparing a given volume of the air to be tested with a sample of air from which CO_2 has been removed; the difference of pressure is recorded by means of a mercurial column.

4. *Reiset's method* calculates the amount of CO_2 in the air from the difference found between the titration of a given volume of barium water before and after the passage of the air through it.

Methods of Ventilation.—There are various methods of securing ventilation, some of which are as follows:

In the *Auburn* or *Pentonville system* of ventilating prisons the cells are arranged in blocks of several tiers in height, and each block is surrounded by an outer building, between the walls of which and the doors of the tiers of cells on each side there is an open corridor, not divided by floors corresponding to the floors of the several tiers. The air is drawn from this corridor into the cells.

Boyle's ventilator is an arrangement of mica valves allowing air to pass out, but allowing no back-draft.

Cooper's ventilator is a series of apertures in the glass of a window-pane arranged in a circle so as to be more or less completely closed by a circular disc having corresponding apertures and moving upon a central pivot.

Ellison's ventilating bricks are bricks perforated with conic holes, and fixed in the walls, with the apices of the cone on the outside. They are not likely to produce a draft.

Hinckes-Bird's method consists in placing a movable block of wood under the entire length of the lower window-sash.

Louvred panes are a form of window-ventilation by which an upward direction is imparted to the incoming air. These panes take the place of one or more of the squares of glass, and may be either opened or closed.

McKinnell's ventilator is a combined outlet and inlet ventilator, which is applicable in the case of upper rooms or rooms in single-story houses. It consists of two tubes, the one encircling the other, the inner acting as the outlet, and being fitted with a cowl.

The *Sheringham valve* is a common form of inlet in windows or walls for the purposes of ventilation. The entrance to the opening in the wall is guarded by a strainer to keep out dust, while on the inside is a valved iron plate with closed sides and hinged at the bottom. This opening is usually placed near the ceiling.

The *Smead-Dowd system of ventilation* is an artificial system of ventilation in which the outlets are at the bottom of the sheeting along the floor-line, and open into spaces beneath the floor. These spaces are connected with flues, down which the air is drawn by the powerful action of the furnace-chimney.

Tobin's tube is another means of ventilation, the air from without entering through a hole in the wall and being conducted by an upright tube into the upper portion of the room.

VERATRIN.—A mixture of alkaloids obtained from the seeds of *Asagræa officinalis.* See VERATRUM. It is an exceedingly poisonous local irritant, and is used mainly as an external application for neuralgia, gout, and rheumatism. Dose, 1/50 to 1/10 grain. Two preparations for external use are official—**Oleatum Veratrinæ** (containing 2 parts of veratrin dissolved in 50 parts of oleic acid and olive oil to 100) and the **Unguentum Veratrinæ** (containing 4 parts of veratrin and 6 parts expressed oil of almond incorporated with 90 parts of benzoinated lard). In practice, more than 6 parts of alcohol are necessary to dissolve the veratrin; chloroform and acetic acid are better solvents than alcohol. Veratrin is revulsant and parasiticide. When brought in contact with cutaneous surfaces, it is exceedingly irritating, producing a feeling of warmth, followed by a sense of tingling.

In neuralgia, especially in tic douloureux, the ointment of veratrin, rubbed into the affected part until it causes a sense of tingling, is often productive of great relief.

℞.	Veratrin,	gr. xxv
	Alcohol,	ʒ vj
	Glycerin,	ʒ ij.

Paint along the course of the affected nerve with a camel's-hair brush twice daily.

This should not be applied if inflammatory symptoms are present. Veratrin has been highly commended by some ophthalmic surgeons as a remedy in orbital neuralgia. It is applied to the temple and brow in the form of ointment, containing from 1 to 4 grains to the dram, according to the degree of irritation desired and the sensitiveness of the skin. The proportion in the official ointment is 1 part in 26.5. Great care is necessary to keep it out of the eye, as it causes a violent and persistent conjunctivitis. The oleate (1:50, U. S. P.) is an excellent preparation. It is doubtful whether, as an external application, this drug has any therapeutic effect that cannot be attributed to the counterirritation it produces.

VERATRUM VIRIDE (Hellebore).—The dried rhizome and roots of *Veratrum viride,* American hellebore, or *veratrum album,* white hellebore. They contain the alkaloids *jervin, pseudojervin,* and *rubijervin;* but veratrum viride contains also *veratrin* (*cevadin*), and veratrum album contains also *protoveratrin, protoveratridin* and other alkaloids. Dose, 1 to 3 grains.

Asagræa officinalis, veratrum sabadilla, cevadilla, is the source of the official veratrin, and is a mixture of alkaloids. It contains the alkaloids *veratrin* (*cevadin*), *cevadillin*, *sabadin*, *sabadinin*, and another base known as *Wright's veratrin*. It is a violent emetic and cathartic, and is actively poisonous; it is now little used, except as an insect powder. For this use it is highly valued, as it destroys many insects which the ordinary buhach does not affect. Veratrum viride is a powerful depressant of the heart and a paralyzant of the spinal cord. Its action is similar to that of aconite, but is regarded as inferior. The chief use is as a circulatory sedative in acute, sthenic, or dynamic inflammations. It is highly esteemed in puerperal fevers, pneumonia, pleurisy, hepatitis, peritonitis, cerebritis, and aneurysm. It is contraindicated in conditions of exhaustion or depression, or if vomiting is feared.

In *poisoning* by veratrum viride cardiac stimulants, atropin, strychnin, and external heat are indicated. **V., Flext.** Dose, 1 to 4 minims. **V., Tinct.,** 10 percent. Dose, 10 to 30 minims.

VERMIFORM APPENDIX.—See Appendicitis.

VERMIFUGE.—See Anthelmintics, Worms.

VERONAL.—Diethyl Malonylurea.—It is a very efficient and rapid hypnotic in doses of 8 to 10 grains, given in some hot liquid. It induces a practically normal sleep, does not affect the heart, circulation or kidneys, and is free from after-effects. It is particularly efficient when mixed with sulphonethylmethane (trional) in the proportion of two parts of the former to one of the latter (*e. g.*, gr. viii with gr. iv).

VERONAL-SODIUM.—Sodium diethyl-barbiturate. Its action and dosage are the same as veronal, but it is said to act more rapidly by reason of its greater solubility.

VERRUCA.—See Warts.

VERSION.—See Fetus (Positions and Presentations).

VERTIGO (Dizziness).—A subjective state in which the individual affected, or the objects about him, seem to be in rapid motion, either of a rotatory, circular, or to-and-fro character.

The etiology of an attack of vertigo depends upon the particular variety.

Ocular vertigo results from the paresis of one or more of the ocular muscles, or from eye-strain.

Aural or auditory vertigo, or Ménière's disease, results from disease of the semicircular canals and cochlea. Ménière's Disease (*q. v.*), properly so called, is a sudden severe vertigo, the result either of a hemorrhage or of a serous or purulent exudation into the semicircular canals.

Gastric vertigo is the most common variety, and results either from stomachic or intestinal dyspepsia, disordered hepatic function or constipation. The mechanism of the vertigo is complex. There are two factors; one consists in the toxic effect of the imperfectly oxidized materials that accumulate in the blood; the other is reflex. An impression made on the end-organs of the pneumogastric nerve in the stomach is reflected over the sympathetic ganglia.

Nervous vertigo is associated with migraine and with sick or nervous headache, and is also caused by physical or nervous excesses and by the immoderate use of tea, coffee, alcohol, and tobacco. It is also a result of many of the organic diseases of the brain.

Senile vertigo is the result of the disordered cerebral circulation resulting from changes in the heart and vessels.

Symptoms.—In all varieties of vertigo the symptom of a sensation of objects moving around the patient, or of the patient moving around objects that remain stationary, is present in some degree. The attack of giddiness comes on suddenly, with indistinctness of vision and slight confusion of the thoughts. The patient may fall, unless he grasps something to steady himself. Nausea and vomiting, and cardiac palpitation with tinnitus aurium, are often associated with the vertiginous sensations. There is no loss of consciousness.

In ocular vertigo the attack is usually the result of reading, writing, sewing, or other close application of the eyes, the ordinary symptoms of vertigo being preceded by headache, nausea, specks before the eyes, and pain in the eyeballs.

The prognosis is favorable in ocular and gastric vertigo. Unless the result of organic disease, the prognosis is favorable in nervous vertigo. In auricular vertigo the prognosis is fair, but in genuine Ménière's disease the prognosis is unfavorable, as it is also in senile vertigo.

Treatment.—For ocular vertigo rest for the eyes is necessary and properly adjusted glasses are required. For cases of Ménière's disease rest in the recumbent position and the use of full doses of quinin, 10 to 15 grains daily for a long period, as suggested by Charcot.

For gastric vertigo a careful regulation of the diet is indicated. At the beginning of the treatment it is often of great advantage to place the patient on an exclusively milk diet, gradually widening the variety of food as improvement occurs. In these cases a course of arsenic is often serviceable. If the digestion is torpid, the use of tincture of nux vomica is indicated. If the bowels are constipated, benefit is obtained from fluidextract of cascara sagrada.

For nervous vertigo the removal of the exciting cause and the use of such remedies as iron, quinin, and strychnin, either alone or variously combined, are demanded. For senile vertigo a highly nutritious but easily digested diet, the use of pure stimulants, and a course of mercuric chlorid, or arsenic with tincture of nux vomica, are advisable.

In all varieties of vertigo the habits of the patient must be most abstemious, excluding tobacco, tea, coffee, highly seasoned foods, malt liquors, and alcohol unless particularly indicated.

VESICAL CALCULUS.—See Bladder (Stone).

VESICANTS.—See Counterirritation.

VIABILITY.—Ability to live; applied to a child at the time of birth. The term indicates the capacity for independent existence. Viability has chiefly to be determined by the age of the fetus and by its condition as regards formation, health, and strength. It also depends in some measure upon the season of the year and upon the climate in which the child is born.

The earliest period at which a child can be born, in temperate climates, and be capable of living and of reaching maturity, is usually regarded as about 7 months, or 210 days. Cases are on record of children born at the sixth month who were reared.

Signs of maturity are: Strong movements and cries directly after birth; the body is of a clear pink or red color, and is covered with sebaceous matter; the mouth, nostrils, eyelids, and ears are open; the nails reach, if not extend beyond, the finger-tips; the hair and eyebrows are completely developed, the hair of the head being about an inch long; the skull is somewhat firm, the fontanels are not far apart; the four portions of the occipital bone are distinct, and the external auditory meatus is cartilaginous; the testicles have passed the inguinal ring; there is meconium at the end of the large intestine or it is freely discharged and urine is passed; there is a point of ossification in the center of the cartilage at the lower end of the femur. The power of suction has developed, as evidenced by placing a nipple or the finger in the mouth. The ordinary length of the child is from 16 to 20 inches and the weight is from 4 to 7 pounds.

Between the sixth and seventh months the length of the fetus is from 10 to 14 inches. The skin is of a dusky red color and is covered with down and sebaceous matter; the pupillary membranes are disappearing and the nails do not reach to the ends of the fingers. Meconium may be found at the upper end of the large intestine and the testicles are situated near the kidneys. Points of ossification may be found in four divisions of the sternum and in the astragalus. The center of the body at the sixth month is at the lower end of the sternum, while at the seventh month it is a little below the sternum. The length of the child at eight months is from 14 to 18 inches; its weight is from 3 to 5 1/2 pounds. The skin is rosy and is covered with fine short hairs, with distinct sebaceous envelope; the nails reach to the ends of the fingers, and the pupillary membranes have entirely disappeared; the testicles have descended into the inguinal ring, and there is a point of ossification in the last vertebra of the sacrum. The middle of the body is nearer to the umbilicus than to the sternum..

The signs of immaturity are: The head is out of proportion to the body; the body center is high up; the pupillary membranes are present; the testicles are undescended and the genital organs are of a deep red color; the skin is intensely red, mottled, and coated by a downy covering, sebaceous matter being absent; the nails are imperfectly formed. Movements are feeble; there is inability to suck; artificial heat is necessary; sleep is almost unbroken; the discharges of meconium and of urine are infrequent and imperfect; and the mouth, nostrils, and eyelids are closed.

The tests of live birth are appended:

Breslau Test.—If the intestines and stomach of the infant were found to float in water on removal from the body it was thought to be proof that the child was born alive. This test is of no value.

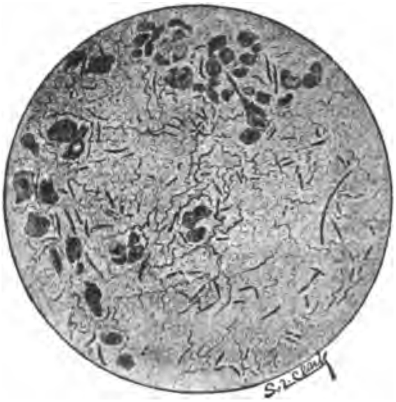
Hydrostatic Test.—Suggested by Raygat. It consists in placing the lungs in water and noting their specific gravity. If inflation has occurred, they will float. This test is valuable.

Ploucquet's Test.—This consists in estimating the ratio of the weight of the lungs to the weight of the body of the child. Ploucquet laid down this rule: that *before respiration* the weight of the lungs compared to the weight of the body was in the ratio of 1:70, and that *after respiration* it was in the ratio of 1:35. The test is of but slight value.

Static Test.—Also called *Foderé's* or *Schmidt's test.* This consists in ascertaining the absolute weight of the lungs, and comparing this weight with the average lung weights of still-born children and of children who have died soon after birth. Foderé fixes the weight of the lungs of still-born children born at term at 480 grains (1 ounce), and 960 grains (2 ounces) as the weight of the lungs soon after breathing has been established. This test is also of but slight value.

VIBURNUM.—**V., opulus,** cramp bark. Dose, 10 to 45 grains. Dose of the fluidextract, 10 to 45 minims. This drug is valued as a remedy for uterine and abdominal pains. **V. prunifolium,** black haw, is also derived from the bark of a shrub of the same natural order. It contains tannic, oxalic, citric, and malic acids, and sulphates and chlorids. It also contains 2 resins, viburnin and viburnic acid, the latter of which is identical with valeric acid.

The **fluidextract** (dose, 10 to 45 minims) is the only preparation. The drug is considered a nervine, and is antispasmodic, astringent, diuretic, and tonic; it is especially useful in preventing abortion, in the nervous diseases of pregnancy, and in spasmodic dysmenorrhea. It may be administered with cannabis indica, with morphin and other nerve sedatives, and with aromatics. Nausea and vomiting are often excited by it. There is no exact observation concerning its physiologic action.



Spirillum of Vincent and the Fusiform Bacillus; Other Organisms are also Present.—(*Rosenberger and Coplin.*)

Liquor sedans is a utero-ovarian sedative and anodyne. Each fluidounce contains of black haw and golden-seal, each 60 grains; Jamaica dogwood, 30 grains; aromatics, a sufficient quantity.

VINCENT'S ANGINA.—A form of pharyngitis or tonsillitis that closely simulates diphtheria. A fusiform bacillus and a spirillum have been demonstrated.

VINEGAR (Acetum).—An impure, dilute acetic acid produced by acetous fermentation of wine, cider, or other fruit-juice. In pharmacy a solution of the active principles of certain drugs in dilute acetic acid. There are two official vinegars: **Acetum Opii** (vinegar of opium) (black drop); containing opium, 10 percent; nutmeg, 3 percent; sugar, 20 percent. It is used as a sedative. Dose, 2 to 15 minims. **Acetum Scillæ** (vinegar of squill), containing 10 percent squill. It is used as an expectorant. Dose, 15 to 45 minims. See ACETIC ACID.

VINUM (Wine).—The fermented juice of fruits, especially that of grapes. White wines are made from the pulp; red wines from the pulp and skins, the latter yielding the coloring-matter.

When medicated, wines (vina) are practically the same as tinctures. The menstruum directed to be used is the official white wine (vinum album), which should contain from 7 to 12 percent by weight of absolute alcohol. It is, however, reinforced by the addition of alcohol to the amount of 5 to 17 1/2 percent in all the medicated wines. In the two ferric wines the alcoholic reinforcement is in the shape of the tincture of sweet orange peel. The wine of coca is made with red wine. The official wines are 10 in number, 2 of which are not medicated, namely white wine and red wine.

Vinum Album (White Wine).—An alcoholic liquid, made by fermenting the juice of fresh grapes, the fruit of *Vitus vinifera* freed from seeds, stems, and skins, and subjected to the usual cellar-treatment for fining and aging. A pale, amber-colored or straw-colored liquid, having a pleasant odor free from yeastiness, and a fruity, agreeable, slightly spirituous taste, without excessive sweetness or acidity.

Vinum Rubrum (Red Wine).—An alcoholic liquid, made by fermenting the juice of fresh, red-colored grapes, the fruit of *Vitus vinifera*, in presence of their skins, and subjected to the usual cellar-treatment for fining and aging. A deep red liquid, having a pleasant odor free from yeastiness, and a fruity, moderately astringent, pleasant and slightly acidulous taste, without excessive sweetness or acidity.

There are eight medicated wines official in the U. S. P., as follows:

TITLE.	ACTIVE CONSTITUENTS.	PROPERTIES AND DOSE.
VINUM:		
Antimonii.......	Tartar-emetic, 0.4 percent.	Expectorant (15 minims).
Cocæ.............	Coca, 6.5 percent.	Stimulant (4 drams).
Colchici seminis..	Colchicum seed, 10 percent.	Diuretic (30 minims).
Ergotæ..........	Ergot, 20 percent.	Emmenagogue, parturient (2 drams).
Ferri............	Cit. iron and ammon., 4 percent.	Tonic, (4 drams).
Ferri amarum....	Cit. iron and quinin, 5 percent.	Tonic (2 drams).
Ipecacuanhæ.....	Fldext. ipecac, 10 percent.	Expectorant (15 minims).
Opii............	Granulated opium, 10 percent.	Sedative (8 minims).

See WINE.

VIOFORM.—Iodochloroxyquinolin. Nioform. Antiseptic and hemostatic in action, it is recommended as an ideal substitute for iodoform.

VIRUS, VACCINE.—See VACCINATION.

VISCEROPTOSIS. (Glénard's Disease, Enteroptosis, Gastroptosis, Splanchnoptosis).—By reason of relaxation of the ligaments, the organs in the abdomen are found below their normal position. Loss of elasticity of the abdominal muscles is a predisposing cause. This may result from gastrointestinal autointoxication, from repeated pregnancies, from pressure of clothing, from hemorrhages. In some cases only one organ may be displaced.

Symptoms.—Nervous dyspepsia, anorexia, constipation or diarrhea may be found, although some cases present no symptoms. There may be abdominal distention, eructations, pains after eating, nervous symptoms such as headache, vertigo, insomnia, emaciation, or chlorosis is frequently found.

Treatment.—If symptoms exist, they may be relieved by a wide bandage or other appliances (such as pads, springs, trusses, or corsets). Lavage is useful in gastroptosis. For permanent relief operation is necessary.

VISION, DEFECTS.—See AMBLYOPIA, BLINDNESS, FIELD OF VISION.

VISION, TESTS. Test-cards.—It has been discovered that the smallest retinal image that can be perceived at the macula corresponds to a visual angle of 1′. The visual angle is the angle included between two lines drawn from two opposite edges of the object through the nodal point. Following this principle, test-types have been constructed in such a manner that every letter is so made that when at its proper distance it subtends an angle of 5′. It is well to have two series of letters, to avoid doubtful results from the patient learning the positions of the letters on a single card.

The mode of procedure in determining the acuity of distant vision with test-types is as follows: The patient is placed with his back to the light in front of the test-cards, which should be hung at a distance of 5 or 6 meters, and should be well illuminated by artificial light from a reflector, about 2 feet away and to one side. The eye not under examination is then covered, and the patient is asked to read the lowest line possible. If, seated at 6 meters' distance, he reads the line marked 6 meters, his visual acuity is expressed by the fraction 6/6; if he reads the line marked 4 meters, he has remarkable acuteness of vision, and we express it by the fraction 6/4; if he is amblyopic. or ametropic he will not be able to read the 6-meter letters, and may possibly read only the line marked 15 meters, when his visual acuity is expressed by the fraction 6/15. Some surgeons prefer to use feet instead of meters in their estimations, and to seat their patients at about 20 feet from the card, expressing the visual acuity by using 20 for the numerator and the foot-number of the card seen as the denominator. It sometimes happens that the patient is not able to read any letter on the card at 6 meters' distance. In such a case he should gradually approach the card or the card should be brought toward him, until the top letter is distinguished. This distance is noted, and serves as the numerator in the fraction of visual acuity.

With illiterates it is best to use a regular illiterate card, consisting of lines shaped like the plain capital letter E. The patient is asked to tell which way the prongs of the E point—upward, downward, to the right, or to the left. More difficult are the Burchardt dots for counting. These cards are constructed on the Snellen principle. For foreigners special cards have been constructed. The German and Hebrew letters are often of value in hospital work.

Testing Near Vision.—The test-cards usually employed to estimate the accommodation are after the model of Jaeger, and are merely printers' types of various sizes. These cards have the advantage of closely resembling the work ordinarily done by the eye in reading, but have the disadvantage that they are not arranged on any scientific plan. It is possibly better to use cards in which each word is composed of several letters constructed in strict conformity with the Snellen basis of letter-formation.

The mode of procedure with the near type is to find the furthest and nearest point at which the smallest recognizable type is readable. In presbyopes it is necessary to use a convex lens of a strength varying with the age of the patient. Each eye should be examined separately. See also BLINDNESS (Tests).

VITILIGO (Leukoderma).—An acquired pigmentary affection, characterized by variously sized and shaped whitish patches with hyperpigmented borders.

Symptoms.—The condition manifests itself as rounded, oval or irregular, milk-white or pinkish-white spots, which tend to spread slowly or rapidly, at times coalescing and producing large patches. These are smooth, soft, sharply defined, and neither elevated nor depressed. The surrounding skin shows increased pigmentation, being usually brownish-yellow in color. The hairs upon the affected areas may or may not turn white. The disease progresses slowly, becoming conspicuous only after a duration of years. In rare cases the affection may involve the greater part or, indeed, the whole of the body. Vitiligo lasts throughout life. The eruption may occur upon any portion of the cutaneous surface, although it is prone to elect the backs of the hands and the trunk. There are no subjective symptoms. Disfigurement is the sole inconvenience. The affection is frequent in negroes, in whom it produces a most striking appearance.

Etiology.—Vitiligo occurs in adult life. In many cases there is no ascertainable cause. It is due, in all probability, to a disturbance of innervation. It is occasionally associated with morphea, alopecia areata, and exophthalmic goiter.

Pathology.—The skin is normal, with the exception of an unequal distribution of coloring-matter. In the white spots there is total absence of pigment whereas in the darkened borders the pigment is abnormally increased.

Diagnosis.—Vitiligo is to be distinguished from chloasma, tinea versicolor, morphea, and leprosy.

In both chloasma and tinea versicolor the patches are brown, whereas in vitiligo they are white. Furthermore, tinea versicolor is scaly, and the fungus is found in the scales. Morphea shows structural alteration of the skin, and the patches in leprosy are anesthetic.

Prognosis.—In rare cases spontaneous recovery has been observed, but the affection may be said to be practically incurable.

Treatment is highly unsatisfactory. Duhring advises the long-continued administration of arsenic. Locally, lotions of corrosive sublimate or acetic acid, as recommended in chloasma, may be applied to the pigmented borders, with a view to dissipating the color and lessening the contrast.

VITREOUS, DISEASES.—The corpus vitreum forms the principal part of the globe of the eye. It consists of 98.6 percent of water. The remainder is composed of transparent fibers extending in all directions. Between these fibers are the compartments in which the nearly pure water, or vitreous humor, is contained. The vitreous is pierced in an irregular sagittal direction by the central canal, about 2 mm. in diameter. In the embryonic state the hyaloid artery traverses this canal, and sometimes persists after birth. The vitreous is contained in a delicate membrane, called the hyaloid membrane.

Hyalitis, or inflammation of the vitreous, is not an independent disease, but is generally associated with inflammation of the uveal tract, particularly of the ciliary body, which causes disturbances of nutrition. It is characterized by change in consistency and by partial disorganization. Opacities, in the form of threads, clouds, or separate flocculi, are seen and cause subjective visual disturbance; and, provided the medium is sufficiently clear, are detected by the ophthalmoscope.

The treatment is constitutional, and under all circumstances should be directed to the cause. It consists chiefly of mercurials and iodids and of leeches to the temple.

VITRIOL.—See SULPHURIC ACID.

VOICE IN DIAGNOSIS.—The voice is the sound produced by the vibration of the vocal bands, modified by the resonance organs. It is of great value in diagnosis.

The Voice in Health.—If the ear is applied over the larynx or trachea of a healthy person, and he is directed to count "twenty-one, twenty-two, twenty-three," in a uniform tone and with moderate force, there is perceived a strong resonance with a sensation of concussion or shock, and a sense of vibration, thrill, or fremitus, the voice seeming to be concentrated and near the ear. Often the articulated words are distinctly transmitted (laryngophony). The sounds thus heard are termed the **normal laryngeal resonance.**

If the ear or stethoscope is applied over the third rib anteriorly on either side of the chest of a healthy person, and he is directed to count "twenty-one, twenty-two, twenty-three," in a uniform tone, with moderate force, a confused distant hum is perceived, of variable intensity, accompanied by more or less vibration, thrill, or fremitus, most distinct in adults, but notably weaker in women than in men. This sound is termed the **normal vocal resonance.**

If the ear or stethoscope is applied over the third rib anteriorly of a healthy person, and he is directed to whisper, in a uniform manner, the words "twenty-one, twenty-two, twenty-three," there is heard a sound corresponding closely in character to the sound of expiration over the same region during the act of forced respiration; or, in other words, a feeble, low-pitched, blowing sound. This sound is termed the **normal bronchial whisper,** and is produced by the air in the bronchial tubes during the act of respiration.

The Voice in Respiratory Diseases.—The normal vocal resonance, as heard over the third rib of the chest anteriorly on either side, may be altered in intensity:

1. *Diminished or absent.*
2. *Increased or exaggerated.*

Or its resonance may be of the character of:

3. *Bronchophony.*
4. *Pectoriloquy.*
5. *Egophony.*
6. *Amphoric voice.*

The vocal resonance may be diminished or feeble in bronchitis with free secretion, in pleurisy with effusion, or in complete consolidation of the lung structure and the bronchial tubes.

The vocal resonance is absent in pneumothorax and in pleurisy with effusion.

Exaggerated vocal resonance differs from the normal resonance in a slight increase of its density. It denotes a slight degree of solidification of lung tissue, and is chiefly of value in the diagnosis of tubercle.

Bronchophony, or the voice concentrated near the ear, raised in pitch and in intensity, denotes complete consolidation of the pulmonary tissue in those parts in which the sound is abnormally present.

Pectoriloquy is complete transmission of the voice to the ear, the articulated words being distinctly recognized. It has a close resemblance to the resonance heard over the larynx in health. Its presence indicates either a pulmonary cavity or more complete consolidation—in other words, an exaggerated bronchophony.

Egophony is a modification of bronchophony, consisting in tremulousness of the voice, its character being nasal or bleating, somewhat suggestive of the cry of a goat. When heard, it may be considered a sign of pleurisy with slight effusion or of pleuropneumonia.

Amphoric voice, or "the echo," as it is sometimes called, is a musical sound, of a somewhat hollow, metallic character, like that produced by blowing into an empty bottle. It is sometimes produced in large cavities within the lung, but is especially incident to pneumothorax.

Increased bronchial whisper is a sound in which the whispered words are abnormally intense and are higher in pitch than in the normal bronchial whisper. It has the same significance as exaggerated vocal resonance. See CHEST (Examination).

The Voice in Other Morbid Conditions.—There are many other changes of the voice that may occur in different conditions, and that may be of value as indicating morbid states. There are differences in the cry of infants—the normal cry, indicating hunger; the cry of irritability or pain (see INFANTILE SYMPTOMS); the changes with respiratory disorders. Skene notices the morbid state of the voice, indicating circulatory disturbances, cases of heart disorder, and Bright's disease, including hyperemia of the vocal cords, lowering and modifying the tone and quality. Anemia raises the pitch of the voice, and a concealed hemorrhage may be detected by one whose attention has been called to this point. He refers to the importance of noticing the condition of the voice as indicating the nervous state before performing major operations, and also to its testimony as showing the amount of shock after an operation. The voice is also of value as indicating the reaction from this condition, and sometimes is the first and only symptom. The voice as an indication of apathetic conditions is also of importance, and frequently is of very valuable prognostic significance. There is a liability to take this apathetic tone as an indication of contentment, a wrong diagnosis resulting. Skene speaks of the expression of the voice after abdominal operations, and of the peculiar voices of the insane. The last, however, he does not venture to remark on extensively. He says that it is necessary, in order thoroughly to utilize this feature in diagnosis, to have had considerable experience, and to possess a normal sense of hearing and ready appreciation of the varieties of quantity and characteristics of sound; but especial refinement of the sense is not necessary.

VOICE, LOSS.—See APHONIA, DYSPHONIA, LARYNGITIS.

VOLVULUS.—See INTESTINAL OBSTRUCTION.

VOMITING.—Vomiting is produced: (1) By local causes, such as irritation of the stomach from disease of the organ (cancer, ulcer, dyspepsia, gastritis), or from the ingestion of certain varieties of food or drugs; (2) by reflex causes, such as cerebral disease, disease of the spinal cord, heart-lung-, or kidney-disease, abdominal tumors, pregnancy, intestinal obstruction, peritonitis, general nervousness, and constipation; (3) by infectious diseases, such as scarlet fever, typhoid fever, cholera, small-pox, yellow fever, malarial fever, and tuberculosis.

Character of Vomitus. Solid or Liquid Food.—Solid food may be ejected from the stomach immediately after it has been taken, as in certain varieties of dyspepsia, and after the ingestion of partly decomposed food.

Acid Vomiting.—This variety usually occurs in cases of dyspepsia with hyperacidity attended by constipation. The fluid is generally thin and highly acid, giving rise to pyrosis, or "water-brash." Excessive flatulence is usually present, attended by heartburn. In many cases the condition is relieved by correcting constipation. See FLATULENCE, CONSTIPATION, GASTRIC NEUROSES.

Mucous Vomiting.—In this variety the vomitus is, for the most part, composed of thick, glairy mucus; it occurs in acute and chronic gastritis.

Bilious Vomiting.—Bile may find its way into the stomach when reversed peristalsis occurs, as in obstruction of the bowels in the early stages, in impaction of a gall-stone, and in malarial fever or yellow fever.

Fecal vomiting occurs in the later stages of intestinal obstruction.

Bloody vomit (hematemesis) is seen in gastric cancer, in ulceration of the stomach, in yellow fever, and in some cases of cirrhosis of the liver.

Purulent vomit is due to rupture of an abscess into the stomach or esophagus.

Profuse Vomiting.—Profuse vomiting is generally due to gastric dilatation, as seen in cases of gluttony, prolonged debauch, and gastric cancer. In most instances it occurs a long tme after eating. The material usually contains sarcinæ ventriculi if due to cancer, and sometimes if due to ulcer of the stomach.

Vomiting due to Cerebral Causes.—Vomiting due to intracranial disease generally occurs soon after the food has been taken, and is usually unattended by premonitory feelings of nausea or discomfort. Gowers states that when this variety of vomiting is accompanied by persistent pain in the head, and when it occurs with increased frequency, it should always give rise to suspicion of cerebral disease. In such cases optic neuritis would point directly to intracranial disturbance.

Vomiting in Infectious Diseases.—Vomiting occurs during the onset of most of the infectious diseases, especially in children.

Treatment of Vomiting.—No well-defined rule can be laid down that would apply to all varieties of vomiting. Persistent effort must therefore be made to find the exciting cause of the act of vomiting, and it should be treated upon general principles. Cold applications and ice by the mouth will allay the irritability of the stomach. In cases of collapse heat may be used locally. Cocain may be administered in severe cases. The usual treatment of the vomiting of indigestion or debauch is the administration of calomel in small doses (1/10 grain every hour), followed by a purgative. Bismuth subnitrate, cerium oxalate and validol have been recommended. The immediate diet must be very scant and should be chiefly liquid. See EMETICS, ANTIEMETICS.

VOMITING OF PREGNANCY.—There is a physiologic, an exaggerated, and a pernicious vomiting in pregnancy. The first two forms are of minor importance; the last is a serious affection, requiring active treatment. See PREGNANCY (Pernicious Vomiting).

VULVA, DISEASES.—**Inflammation** of the vulva, or **vulvitis**, is usually the result of gonorrhea. It may be due to irritating discharges from other conditions, such as cancer of the cervix, corporeal endometritis, or a vesicovaginal fistula. In children it is seen not infrequently as the result of uncleanliness.

The symptoms are pain and burning of the vulva with more or less discharge. The parts are inflamed and somewhat edematous.

Treatment consists in rest in bed and in frequent cleansing of the vulva with boric acid solution (1 dram to 1 pint). As the acute symptoms subside the inflamed areas may be painted with a 2 percent solution of nitrate of silver. This should be repeated daily until all evidence of the disease has subsided.

Should the inflammation become localized in the mucous or sebaceous glands of the vulva, the affected glands should be punctured and cauterized with pure carbolic acid.

Hematoma of the vulva is usually a complication of labor, and is the result of subcutaneous rupture of a vein. It generally occurs as the result of other forms of traumatism.

Treatment consists in thorough cleanliness of the parts and in slight compression of the tumor, which will cause its rapid absorption. Should infection occur, the tumor should be incised and the blood-clot turned out, and the cavity should be irrigated and packed with gauze.

Papilloma of the vulva is usually the result of venereal disease. It is sometimes caused by uncleanliness, and may exist as a complication of pregnancy. Papillomata occur usually in two forms—as small, isolated, warty growths, or as distinct cauliflower-like tumors.

The treatment is excision. The small warts may be snipped off with scissors, after which their bases should be cauterized. The larger growths should be excised and the wounds should be closed with interrupted sutures.

Pruritus.—Itching of the vulva may be due to a variety of causes. It not infrequently occurs as the result of irritating discharges, or it may be due to tubal or ovarian disease or to uncleanliness. Diabetic urine may cause this disease, or it may exist without any ascertainable cause, when it is called idiopathic pruritus. The intense itching of the vulva causes scratching and rubbing, which are finally followed by irritation, inflammation, and discharge.

Treatment consists in relieving the cause. If it is due to discharge from the uterus, measures should be taken to prevent this. A vaginal tampon should be worn and perfect cleanliness should be practised. Diabetic urine should be prevented from coming in contact with the vulva, and the patient should exercise care in thoroughly drying herself after urination. Local applications will sometimes be of value. One of the best is:

℞.	Tincture of opium, Tincture of iodin, Tincture of aconite,	each, ʒ v
	Carbolic acid,	ʒj.

This may be applied to the parts 2 or 3 times daily.

The following ointment may be employed:

℞.	Menthol,	ʒ j
	Lanolin,	℥ ij.

In some cases cauterization with pure carbolic acid may give relief.

W

WAHOO.—See Euonymus.

WALCHER'S POSITION.—See Gynecologic Examination (Table of Postures and Positions).

WARBURG'S TINCTURE.—See Quinin.

WARTS (Verrucæ).—Pinhead-sized to bean-sized circumscribed elevations of the skin due to epidermal and papillary hypertrophy.

Symptoms.—Various forms of warts are distinguished:

Verruca Vulgaris.—This is the common wart seen upon the hands. It is a pea-sized, rounded, rough or smooth, broad-based elevation, yellow or brownish in color. It may occur singly or in numbers.

Verruca Plana.—This is distinguished from the ordinary wart by being flat and broad. Flat warts are pea-sized or fingernail-sized, but slightly elevated, and of a brownish or blackish color. They occur in numbers, usually upon the backs of elderly individuals (**verruca senilis**). Occasionally, numerous small flat warts occur upon the face.

Verruca Filiformis.—These warts are slender, thread-like outgrowths, about 1/8 of an inch in length, occurring chiefly upon the face, eyelids, and neck.

Verruca Digitata.—These are slightly elevated pea-sized to fingernail-sized excrescences, with numerous digitations branching out from the base. The scalp is the most common site.

Verruca Acuminata (Pointed Condyloma, Venereal Warts).—These are pinkish or reddish, sessile or pedunculated, pointed vegetations occurring about the mucocutaneous surfaces (penis, labia, anus, mouth, etc.) of young individuals. Occurring upon the genitals, they are bathed in an offensive puriform secretion. These warts grow rapidly, not infrequently attaining the size of an egg. They bear at times a strong resemblance to a raspberry, to cauliflower, or to a cockscomb.

Etiology.—It is probable that at least some forms of warts are due to microorganisms, and that they are autoinoculable and contagious. Venereal warts are caused by contact with irritating secretions containing, in all probability, the causal microorganisms.

Pathology.—Warts consist of a hyperplasia of the papillæ of the corium and the overlying layers of the epidermis. A vascular loop is found in the center of each wart. In the acuminate variety the connective tissue and vascular hypertrophy is marked, while the horny layer is but slightly hyperplastic.

Treatment.—Warts may be removed by caustics, excision, erasion, or electrolysis. The best caustics to be employed are nitric acid, caustic potash, chromic acid, or glacial acetic acid. These should be cautiously applied from time to time until the disappearance of the wart. An excellent method is to scrape away the wart with a curette and to apply the stick of nitrate of silver to the base.

Salicylic acid in collodion or alcohol is often successful in causing the disappearance of warts.

℞.	Salicylic acid,	ʒ j
	Alcohol,	℥ j.

Apply 2 or 3 times a day.

Or—

℞.	Salicylic acid,	ʒ j
	Collodion,	℥ j.

Apply twice a day.

The use of a 1:500 corrosive sublimate solution is sometimes efficacious, as is also an alcoholic solution of resorcin, 30 grains to the ounce.

Filiform or digitate warts may be snipped off with curved scissors, the base being subsequently cauterized. Venereal warts may be washed with solutions of alum, tannin, or chlorinated soda, and then dusted with calomel, or they may be cauterized with nitric, carbolic, or chromic acid. Cleanliness should be strictly enjoined.

It has been claimed recently that chrysarobin is a specific for warts. The surface of the warts is carefully thinned with a sharp, fine glass-paper which gives better results than paring with a knife, as the patient is less afraid of injuring himself and can more conveniently handle the paper. Chrysarobin may be applied either in a 10 percent solution of the ordinary gutta-percha solution or in a 10 percent ether solution. It is best to apply the chrysarobin at night, and to advise the patient to put on an old stocking, to prevent soiling the bedclothing. Application once a day in this way seems ordinarily to be sufficient, but in obstinate cases it should be applied both night and morning.

The influence of chrysarobin is not only upon the keratinized portion of the skin, but also upon the proliferated blood-vessels in the papillary central part, for both disappear and true skin is formed over the surface.

WASSERMANN REACTION.—See Syphilis.

WATER (Aqua). H_2O.—Natural water in its purest attainable state is a colorless, limpid liquid, devoid of odor or taste, and neutral in reaction. Besides entering into the composition of most of the official extracts, fluidextracts, and many other pharamaceutic preparations, from it are prepared the official waters Aquæ (see Aqua), and also the following: **Aqua Destillata** (distilled water), H_2O: 1000 parts of water are distilled, the first 100 parts obtained being thrown away and 800 parts preserved. It is as near chemically pure water as can be obtained.

Uses of Water in the Human Body.—Water constitutes between 60 and 66 percent of the human body. Its uses have been well summarized by W. G. Thompson as follows: "(1) It enters into the chemical composition of the tissues. (2) It forms the chief ingredient of all the fluids of the body and maintains their proper degree of dilution. (3) By moistening various surfaces of the body, such as the mucous and the serous membranes, it prevents friction and the uncomfortable symptoms which might result from their drying. (4) It furnishes in the blood and lymph a fluid medium by which food may be taken to remote parts of the body and the waste matter removed, thus promoting rapid tissue changes. (5) It serves as a distributor of body heat. (6) It regulates the body temperature by the physical processes of absorption and evaporation."

Nomenclature of Water.—See AQUA.

Therapeutics.—**Cold water or ice** has many external applications of value in the treatment of disease. As a wet pack it is used in tonsillitis, diphtheria, and croup. Cold baths are the most effective antipyretic in the high temperature of fevers, and the cold wet pack is used for the same purpose. Ice or cold water is applied to the head in acute cerebral congestion, and to the spine in chorea, etc.; also locally in hemorrhoids, bubo, orchitis, and to the uterus in postpartum hemorrhage. Cold effusion to the body is employed as a preventive of spasmodic croup, as well as to lessen the tendency to taking cold. See BATH.

Hot water externally—as fomentations, hot wet pack, hot baths, etc.—is most effective in reducing local congestion and in setting up resolution of local inflammation. Hot fomentations to the renal region are useful in functional inactivity of the kidneys. The hot spinal douche is used in affections of the spinal cord and meninges, and in the backache of women. The hot wet pack is highly esteemed in inflammation of the chest organs, and hot injections are useful in chronic inflammation of the uterus. Hot-water dressings for wounds are strongly favored by many surgeons. Vapor and Turkish baths are used as diaphoretics in advanced kidney-disease, in acute and chronic rheumatism, in mineral poisoning, and in syphilis. Warm baths, with cold applications to the head, are of value in infantile convulsions and chorea. See BATH.

Internally, water is chiefly of value as a diuretic, and, if hot, as a diaphoretic. A glass of cold water before breakfast daily is often an effective means of overcoming constipation, while the drinking of hot water an hour before each meal has been of great benefit to many dyspeptics. The value of the popular teas in chronic diseases is almost entirely due to the diluent, diuretic, and diaphoretic actions of the hot water used.

In moderate quantity water is necessary to digestion, but large amounts weaken digestion by diluting the gastric juice. Ice-cold water, if freely used, suspends the action of pepsin and depresses the nerves of the stomach and lowers its blood supply. In some subjects the free use of water internally favors the deposition of fat.

WATER, EXAMINATION.—A **potable water** is one that is *apparently fit* to drink.

An **unpotable water** is one that is *obviously unfit* to drink.

Characteristics of a good drinking water are: (1) It should be clear and limpid. Cloudy and muddy waters should be avoided. (2) It should be colorless. A greenish or yellowish color is usually due to vegetable or animal matter in solution or to organisms. (3) It should be odorless; especially free from sulphuretted hydrogen or putrefactive animal matter. (4) It should not be too cold, but should have a temperature of from 46° F. to 60° F. (5) It should have an agreeable taste; neither flat, salty, nor sweetish. A certain amount of hardness and dissolved gases gives a sparkling taste. It should contain from 25 to 50 c.c. of gases per liter, of which 8 to 10 percent is carbon dioxid and the rest oxygen and nitrogen. (6) It should be as free as possible from dissolved organic matter, especially of animal origin. (7) It should not contain too great an amount of hardness. A certain quantity of saline matter is necessary, however, to give it a good taste. It should not contain over three or four parts of chlorin in 100,000 parts of water (Bartley).

Diseases Which may be Transmitted by Drinking Water.—Typhoid, cholera, dysentery, diarrhea, indigestion, goiter, vesical calculi, intestinal worms, lead poisoning.

At the present day the subject of drinking-water involves the interest, attention, and welfare of every civilized community. The question of health largely depends upon the water consumed, in which may reside the microorganisms of disease and death. In chemic examination the determination of chlorids, of nitrites, and of free and albuminoid ammonia gives an index as to contamination, yet the proof is not absolute.

When, however, an attempt is made to isolate the causative factors in such diseases as typhoid fever, cholera, etc., insurmountable difficulties may present themselves, from the fact that a few microorganisms are scattered throughout a large volume of water, and that the portion of water selected for examination may yield negative results. This condition was instanced in Philadelphia during an epidemic of typhoid fever the origin of which was traced to a burst sewer-pipe that discharged its contents into the water-supply of a certain reservoir. The disease was wide-spread among those who consumed this water, whereas persons in other sections of the city remained comparatively free. A thorough bacteriologic examination of the water failed to show the presence of the typhoid bacillus.

Again, all varieties of potable water contain bacteria, most of which do not seem to be detrimental to health, while water which may contain a few pathogenic bacteria gives rise to epidemic diseases. It is important, therefore, to determine a "standard" in this respect. After the definite number of colonies have been found in a given quantity of water, a sudden fluctuation of this number may indicate contamination.

Qualitative Bacteriologic Analysis of Water.—By this is meant the isolation and study of different species of bacteria in drinking-water.

In collecting the sample extreme care should be exercised to avoid its contamination. If water is to be collected from a hydrant or spigot, it should be allowed to run for from 15 to 20 minutes; if from a spring or lake, it should be taken from about a foot beneath the surface. The specimen should be examined near the region where the sample is procured, and as soon as possible after its collection.

Abbott states that: "In the qualitative analysis it is necessary that a small portion of water—one, two, three, five drops—should first be employed, from which plates are to be made in order to determine the *approximate* number of organisms; also the amount of water necessary to use for each set of plates. Duplicate plates are always to be made—one set upon agar-agar, which should be kept in the incubator at the temperature of the body, and one set upon gelatin, to be kept at from 18° to 20° C." As soon as the colonies have developed, the plates are to be carefully studied and the results compared with subsequent inoculations into animals.

Quantitative Estimation of Bacteria in Water.—The results of the quantitative estimation of bacteria in water are expressed in terms of the number of individual organisms to a definite volume. The water should be examined in the spot where it is collected.

Collection of the Water.—For this purpose a glass bulb drawn out into a pointed extremity and sealed while hot should be used. The stem should be broken off under water, when, owing to negative pressure, the bulb fills with water.

The number of organisms in a fixed volume is approximately determined by the plate or tube method, at first selecting 1 or 2 drops, and finally 1 c.c. of water. If the original drop of water contained too many colonies to be counted, it should be diluted with 10, 25, or 100 volumes of water, the results being expressed in terms of the number of bacteria to a cubic centimeter of water.

It is always essential to make duplicate plates.

Method of Counting the Colonies on Plates.—For this purpose the Wolffhügel's counting apparatus is used. When the colonies are quite small, an ordinary hand lens may be used. Esmarch also has devised an apparatus for counting the number of colonies of bacteria in water.

Chemic Analysis of Water.—In order to determine the fitness of a water for potable purposes both chemic and bacteriologic examinations are necessary. While the value of drinking-water may be judged by the chemic method alone, the evidence is not absolutely conclusive, because it is desired most frequently to determine whether or not there is pollution from sewage, and this information cannot always be derived from a chemic examination. Unfortunately, the bacteriologic examination does not always tell this, because it is hard to obtain a standard of water in which a certain number of colonies of bacteria can be allowed to a cubic centimeter; and also on account of the fact that the typhoid bacillus or other pathogenic organism is seldom found, because so few bacteria exist in comparatively large quantities of water, and thus erroneous results may be derived from the examination.

A method of analysis, though seemingly primitive, may and does frequently present such evidence as to prevent the use of contaminated water; this method may be called "examination by the senses," and, according to Blyth, "water that is evidently turbid, that possesses an odor and an unpleasant taste, requires no analytic processes to condemn it entirely; such water is unsuitable for drinking purposes."

Another simple water test is as follows: Into a stoppered, ground-glass, perfectly clean bottle put 5 ounces of the water to be tested. To the water add 10 grains of pure, granulated, white sugar. Cork tightly, and set in a window exposed freely to light, but not to the direct rays of the sun. Do not disturb the bottle, and keep the temperature as near 70° F. as possible. If the water contains organic matter, within 48 hours an abundance of whitish specks will be seen floating about; and the more organic matter, the more specks. In a week or 10 days, if the water is very bad, the odor of rancid butter will be noticed on removing the stopper. The little specks will settle to the bottom, where they appear as white, flocculent masses. Such water should not be used for potable purposes.

Drinking-water should be free from such elements as lead, copper, barium, zinc, manganese, chromium, and arsenic. After eliminating these elements, the chemic analysis of drinking-water resolves itself into the estimation of (1) the total amount of solids; (2) amount of chlorids; (3) amount of free and albuminoid ammonia; (4) amount of nitrates; (5) presence or absence of nitrites; (6) amount of hardness; (7) organic matter.

Percentage of Elements Allowed in Potable Water.

Total solids,	30	parts to	100,000
Chlorids (NaCl),	2 or 8	parts to	100,000 (suspicious).
Free and albuminoid ammonia,	0.15	parts to	1,000,000
Nitrates,	3 or 4	parts to	1,000,000
Nitrites,	none		
Hardness ($CaCO_3$),	20 grains	to	100,000
Organic matter,	——		

The total solids are determined by evaporating a given quantity of water and weighing the residue.

The chlorids are usually estimated as NaCl, and are determined by a standard solution (not a normal solution) of nitrate of silver. In this way the molecular weight of $AgNO_3$ is expressed in milligrams (170 being the molecular weight of $AgNO_3$ when dissolved in 1000 c.c.):

1000 c.c. equals 170.0 grams
100 c.c. equals 1.70 grams
1 c.c. equals 0.0170 grams. (170 milligrams)

Free and Albuminoid Ammonia.—For the estimation of free and albuminoid ammonia the most delicate apparatus must be used and exceedingly careful methods must be exercised. The requisites are (1) Nessler's solution; (2) solution of ammonium sulphate; (3) solution of sodium carbonate; (4) solution of potassium permanganate; (5) distilled water free from ammonia.

Nessler's solution is prepared by dissolving 50 grains of potassium iodid in a small quantity of hot water and adding, while the solution is hot, a strong aqueous solution of mercuric chlorid (40 grams to 300 c.c. of water) until the red precipitate just redissolves; filter, add to the filtrate a strong solution of 200 grams of potassium hydrate, filter, dilute to 1000 c.c., add 5 c.c. of a saturated solution of mercuric chlorid, allow the precipitate formed to settle, decant the clear fluid, and preserve it in a glass-stoppered vial.

To determine the amount of *free ammonia*, the water to be examined is placed in a retort with a small quantity of solution of sodium carbonate and distilled. The amount is determined by the Nessler solution, and a known quantity of ammonium sulphate is used as an indicator.

To determine the amount of *combined or albuminoid ammonia*, the distillate is freed from ammonia, potassium permanganate is added, and successive portions are tested until less than 0.01 milligram of NH_3 is obtained, deduct ammonia due to potassium permanganate and the result gives albuminoid (free) ammonia.

The nitrates are determined by evaporating 2 or 3 liters of water, adding caustic lime, heating, transferring to a Liebig condenser, and introducing a thin sheet of zinc plated with copper. The distillate is then evaporated with platinum tetrachlorid and the amount of nitrates is calculated from the spongy platinum in terms of nitric acid.

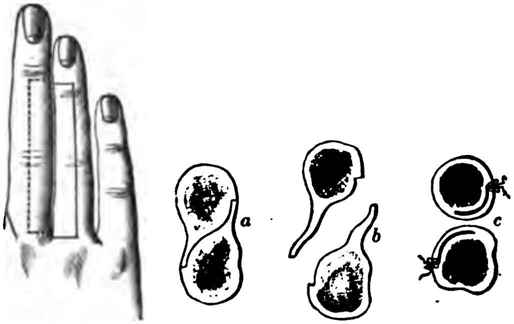
Nitrites.—The following method is sometimes used. It consists in placing the water to be tested in a narrow glass cylinder and adding 1 c.c. of a solution of sulphuric acid (35 percent), and afterward a solution of metaphenylenediamin, with a solution of argentic nitrate of known strength as an indicator, similar comparisons are made with the metaphenylenediamin until the two colors are identical, when the amount of nitrites in the given sample can be calculated.

Hardness is mainly due to the bicarbonates of calcium and magnesium. To determine the hardness of water a solution of soap is made by dissolving 10 grams of soda soap in 1 liter of 90 percent alcohol; filter this and add 100 c.c. of the filtrate to 100 c.c. of distilled water and 33 c.c. of alcohol. Then prepare a solution of calcium chlorid by adding a small quantity of dilute hydrochloric acid to calcium carbonate, dissolving the residue in 1000 c.c. of water; dilute 10 c.c. of this with 100 c.c. of water, and add soda soap, shaking gently until a lather forms that remains unbroken for 5 minutes. From this as an indicator the amount of hardness is determined in a given sample of water.

Organic Matter.—Evaporate 250 c.c. of water to dryness in a platinum dish, first in a water-bath, then in an air-bath, and reweigh. Heat again to a low red heat until all the organic matter is destroyed, add water saturated with CO_2, evaporate, dry, and weigh. Repeat the process with CO_2. The difference between this weight and the first expresses the amount of organic and volatile matter. Organic matter of animal origin—such as sewage—during oxidation first changes into nitrous acid and nitrites, then into nitric acid and nitrates. The presence of nitrites is always a cause for suspicion. Any increased amount of nitrates should be carefully watched. The presence of nitrites, with an unduly large proportion of chlorid and of free and albuminoid ammonia, indicates the presence of sewage. In fresh sewage nitrites and nitrates may be diminished or absent.

WEANING.—See INFANT (Care), MILK (Mother's).

WEBBED FINGERS (Syndactilism).—This condition is treated by incising the web in such a way as to form a flap which is used to cover the raw surface between the roots of the fingers, or by raising two flaps of skin by an incision along the middle of the palmar surface of one finger, and another along the dorsal surface of the other finger; the flaps are then separated and wrapped around the fingers.



OPERATION FOR WEBBED FINGERS.—(*Stimson.*)

WEIGHTS AND MEASURES.

TROY WEIGHT.

Grains.
24 = 1 dwt.
480 = 20 dwt. = 1 oz.
5760 = 240 dwt. = 12 oz. = 1 lb. = 22.816 cu. in. of distilled water at 62° F.

AVOIRDUPOIS WEIGHT.

Drams. *Ounces.*
16 = 1 = 437.5 grains troy.
256 = 16 = 1 lb. = 1.2153 lb. troy.
6400 = 400 = 25 lb. = 1 quarter.
25,600 = 1,600 = 100 lb. = 4 quarters = 1 cwt.
512,000 = 32,000 = 2000 lb. = 80 quarters = 20 cwt. = 1 ton.

APOTHECARIES' WEIGHT.

Grains.
20 = 1 scruple.
60 = 3 scruples = 1 dram.
480 = 24 scruples = 8 drams = 1 oz.
5760 = 288 scruples = 96 drams = 12 oz. = 1 lb.

APOTHECARIES' MEASURE.

60 minims = 1 fluidram.
8 fluidrams = 1 fluidounce.
16 fluidounces = 1 pint.
2 pints = 1 quart.
4 quarts = 1 gallon.

Forty-five drops of water, or a common tablespoonful, make about 1 fluidram; 2 tablespoonfuls, about 1 fluidounce; a wine glassful is about 1 1/2 fluidounces; and a teacupful, about 4 fluidounces.

LIQUID OR WINE MEASURE.

Gills.

1 = 7.2187 cu. in.
4 = 1 pint 28.875 cu. in.
8 = 2 pints = 1 quart = 55.75 cu. in.
32 = 8 pints = 4 quarts = 1 gallon.
2016 = 504 pints = 252 quarts = 63 gallons = 1 hogshead.
4032 = 1008 pints = 504 quarts = 126 gallons = 2 hogsheads = 1 pipe.
8064 = 2016 pints = 1008 quarts = 252 gallons = 4 hogsheads = 2 pipes = 1 tun.

LONG MEASURE.

Inches.

12 = 1 foot.
36 = 3 feet = 1 yard.
72 = 6 feet = 2 yards = 1 fathom.
198 = 16.5 feet = 5.5 yards = 2.75 fathoms = 1 perch.
7920 = 660 feet = 220 yards = 110 fathoms = 40 perches = 1 furlong.
63,360 = 5280 feet = 1760 yards = 880 fathoms = 320 perches = 8 furlongs = 1 mile

SQUARE MEASURE.

Sq. Inches. Sq. Feet.

144 = 1
1296 = 9 = 1 sq. yard.
39,204 = 272.25 = 30.25 sq. yards = 1 perch.
1,568,160 = 10,890 = 1210 sq. yards = 40 perches = 1 rood.
6,272,640 = 43,560 = 4840 sq. yards = 160 perches = 4 roods = 1 acre.

An acre is 69.5701 square yards; or, 208.710321 square feet.

A township is 6 miles square = 36 sections.
A section is 1 mile square = 640 acres.
¼ section is ½ mile square = 160 acres.
$\frac{1}{16}$ section is ¼ mile square = 40 acres.

The standard United States bushel is the Winchester bushel (cylinder form, 18½ in. diameter, and 8 in. deep). } = 2150.42 cubic inches.

The English Imperial bushel = { 2218.192 cubic inches.
1.03152 U. S. bushels.

The English quarter = { 8 Imperial bushels.
8¼ (nearly) U. S. bushels.
10.2694 cubic feet.

SOLID MEASURE.

Cu. In.

1728 = 1 cubic foot.
46,656 = 27 cubic feet = 1 cubic yard.

DRY MEASURE.

Pints.

1 = 33.6 cubic inches.
2 = 1 quart = 67.2 cubic in.
8 = 4 quarts = 1 gallon = 268.8 cubic in.
16 = 8 quarts = 2 gallons = 1 peck = 537.6 cubic in.
64 = 32 quarts = 8 gallons = 4 pecks = 1 bushel.

METRIC OR FRENCH WEIGHTS.

	Gram.	Troy Grains.	Avoir. Ounces.	Avoir Pounds.
Milligram	= 0.001	= 0.01543		
Centigram	= 0.01	= 0.15433		
Decigram	= 0.1	= 1.5433		
Gram	= 1	= 15.43316	= 0.03528	= 0.0022047
Decagram	= 10		= 0.3528	= 0.022047
Hectogram	= 100		= 3.52758	= 0.2204737
Kilogram	= 1000		= 35.2758	= 2.204737
Myriogram	= 10,000			= 22.04737
Quintal	= 100,000			= 220.4737
Tonneau	= 1,000,000			= 2204.737

METRIC OR FRENCH DRY AND LIQUID MEASURES.

	Lit.	U. S. Cu. In.			U. S.
Milliliter	= 0.001	= 0.061 =	Liquid	0.00845	gill.
			Dry	0.0018	pint.
Centiliter	= 0.01	= 0.61 =	Liquid	0.0845	gill.
			Dry	0.018	pint.
Deciliter	= 0.1	= 6.1 =	Liquid	0.845	gill = 0.2113 pint.
			Dry	0.18	pint.
Liter	= 1	= 61.02 =	Liquid	2.113	pints = 1.057 quarts.
			Dry	1.8	pints = 0.908 quart.
Decaliter	= 10	= 610.16 =	Liquid	2.641	gallons.
			Dry	9.08	quarts = 1.135 pints.
		U. S. Cu. Ft.			
Hectoliter	= 100	= 3.531 =	Liquid	26.414	gallons.
			Dry	2.837	bushels.
Kiloliter	= 1000	= 35.31 =	Liquid	264.141	gallons.
			Dry	28.374	bushels.
Myrialiter	= 10,000	= 353.1 =	Liquid	2641.4	gallons.
			Dry	283.7	bushels.

METRIC OR FRENCH LINEAR MEASURE.

	Meter.	U. S. In.	Ft.	Yd.	Mile.
Millimeter[1]	= 0.001	= 0.03937	= 0.00328		
Centimeter[2]	= 0.01	= 0.3937	= 0.03280		
Decimeter	= 0.1	= 3.937	= 0.32807	= 0.10936	
Meter	= 1	= 39.3685	= 3.2807	= 1.0936	
Decameter	= 10		= 32.807	= 10.936	
Hectometer	= 100		= 328.07	= 109.36	= 0.0621347
Kilometer	= 1000		= 3280.7	= 1093.6	= 0.6213466
Myriameter	= 10,000		= 32,807	= 10,936	= 0.213466

[1] Nearly $\frac{1}{25}$ of an inch. [2] Full $\frac{2}{5}$ of an inch.

METRIC OR FRENCH SQUARE MEASURE.

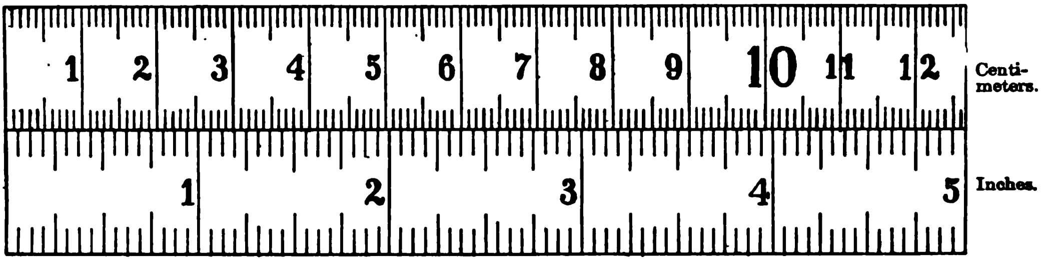
	Sq. Meter.	*U. S. Sq. In.*	*Sq. Ft.*	*Sq. Yd.*	*Acre.*
Sq. centimeter	= 0.01	= 0.155			
Sq. decimeter	= 0.1	= 15.5	= 0.10763	= 0.01196	
Centiare	= 1	= 1549.88	= 10.763	= 1.196	= 0.00025
Are	= 10	= 154988	= 1076.3	= 119.6	= 0.0247
Hectare	= 100		= 107,630	= 11,959	= 2.47
Sq. kilometer	= 0.38607 sq. mile.				= 247
Sq. myriameter	= 38.607 sq. miles.				= 24,708

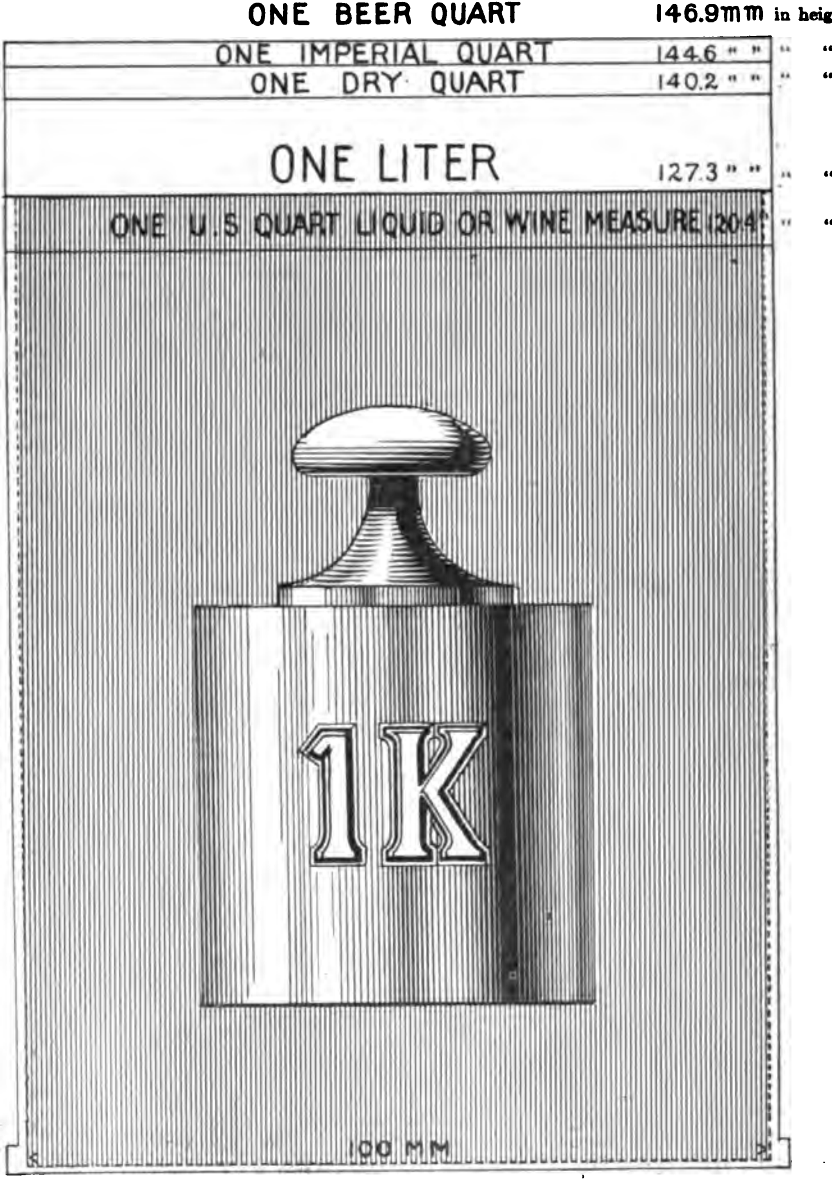
COMPARISON OF U. S. FOREIGN WEIGHTS AND MEASURES.

	WEIGHTS.		LIQUID MEASURES.		DRY MEASURES.	
	Name.	U. S. lb. Av.	*Name.*	U. S. gal.	*Name.*	U. S. bush.
Austria,	Pfund	= 1.235	Euner	= 14.95	Nutze	= 1.745
Bremen,	Pfund	= 1.099	Stubchen	= 0.851	Scheffel	= 2.103
Buenos Ayres,	Libra	= 1.0127	Frasco	= 0.627	Fanega	= 3.894
China,	Catty	= 1.3333	....		Sei	= 3.472
Cuba,	Libra	= 1.0119	Arroba	= 4.1	Fanega	= 3.124
Denmark,	Pund	= 1.1025	Pott	= 0.255	Fonda	= 3.948
England,	Pound	= 1	Imp. gallon	= 1.2003	Imp. bu.	= 1.0315
France,	Kilo	= 2.0246	Liter	= 0.2642	Hectoliter	= 2.838
Hamburg,	Pfund	= 1.0683	Ohm	= 38.278	Fass	= 1.56
Japan,	Monme	= 3.858	Masa	= 0.459		
Mexico,	Libra	= 1.0119	Frasco	= 0.4	Fanega	= 1.547
Norway and Sweden,	Skalpund	= 0.937	Kamea	= 0.662		
Papal States,	Libbra	= 0.7475	Barile (w'e)	= 15.412	Rubblio	= 0.836
Portugal,	Libra	= 1.0119	Almude	= 4.422	Alqueire	= 0.393
Russia,	Funt	= 0.907	Vedro	= 3.249	Chetviert	= 5.956
Turkey,	Oke	= 2.834	....		Kilo	= 1.001

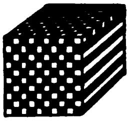
TABLE FOR CONVERTING METRIC WEIGHTS INTO TROY WEIGHTS.

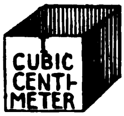
GRAMS.	EXACT EQUIVALENTS IN GRAINS.	APPROXIMATE EQUIVALENTS IN TROY WEIGHTS.				GRAMS.	EXACT EQUIVALENTS IN GRAINS.	APPROXIMATE EQUIVALENTS IN TROY WEIGHTS.				GRAMS.	EXACT EQUIVALENTS IN GRAINS.	APPROXIMATE EQUIVALENTS IN TROY WEIGHTS.			
		Ounces.	Drams.	Scruples.	Grains.			Ounces.	Drams.	Scruples.	Grains.			Ounces.	Drams.	Scruples.	Grains.
0.01	0.1543	....	....	....	1/6	3.0	46.297	....	....	2	6¼	23.0	354.944	....	5	2	5
0.02	0.3086	....	....	....	⅓	4.0	61.729	....	1	....	1¾	24.0	370.376	....	6	....	10⅜
0.03	0.4630	....	....	....	6/13	5.0	77.162	....	1	....	17⅙	25.0	385.809	....	6	1	5⅘
0.04	0.6173	....	....	....	7/11	6.0	92.594	....	1	1	12⅗	26.0	401.241	....	6	2	1¼
0.05	0.7717	....	....	....	¾	7.0	108.026	....	1	2	8	27.0	416.673	....	6	2	16⅔
0.06	0.9260	....	....	....	9/10	8.0	123.459	....	2	....	3½	28.0	432.106	....	7	....	12 1/10
0.07	1.0803	....	....	....	1	9.0	138.891	....	2	....	18 9/10	29.0	447.538	....	7	1	7½
0.08	1.2347	....	....	....	1¼	10.0	154.323	....	2	1	14⅓	30.0	462.970	....	7	2	3
0.09	1.3890	....	....	....	1⅓	11.0	169.756	....	2	2	9¾	31.0	478.403	....	7	2	18⅖
0.1	1.543	....	....	....	1½	12.0	185.188	....	3	....	5⅕	32.0	493.835	1	....	....	13⅚
0.2	3.086	....	....	....	3	13.0	200.621	....	3	1	⅝	40.0	617.294	1	2	....	17 1/10
0.3	4.630	....	....	....	4⅝	14.0	216.053	....	3	1	16	45.0	694.456	1	3	1	10½
0.4	6.173	....	....	....	6⅙	15.0	231.485	....	3	2	11½	50.0	771.617	1	4	2	11⅝
0.5	7.716	....	....	....	7¾	16.0	246.918	....	4	....	6 9/10	60.0	925.941	1	7	1	6
0.6	9.259	....	....	....	9¼	17.0	262.350	....	4	1	2⅓	70.0	1080.264	2	2	....	¼
0.7	10.803	....	....	....	10⅘	18.0	277.782	....	4	1	17¾	80.0	1234.588	2	4	1	14⅗
0.8	12.346	....	....	....	12⅓	19.0	293.215	....	4	2	13⅕	90.0	1388.911	2	7	....	9
0.9	13.889	....	....	....	14	20.0	308.647	....	5	....	8⅝	100.0	1543.235	3	1	2	3¼
1.0	15.432	....	....	....	15½	21.0	324.079	....	5	1	4 1/10						
2.0	30.865	....	....	1	10⅞	22.0	339.512	....	5	1	19½						




ONE BEER QUART 146.9mm in height.
ONE IMPERIAL QUART 144.6 " " " "
ONE DRY QUART 140.2 " " " "
ONE LITER 127.3 " " " "
ONE U.S QUART LIQUID OR WINE MEASURE 120.4 " "
1K
100 MM

Circular base 100 millimeteters in diameter.





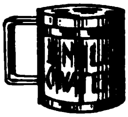


TABLE FOR CONVERTING TROY WEIGHTS INTO METRIC WEIGHTS

Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.	Grains.	Grams.
1	0.0648	16	1.037	31	2.009	46	2.980	61	3.952	76	4.924	91	5.896	300	19.440
2	0.1296	17	1.102	32	2.073	47	3.045	62	4.017	77	4.989	92	5.961	360	23.328
3	0.1944	18	1.166	33	2.138	48	3.110	63	4.082	78	5.054	93	6.026	400	25.920
4	0.2592	19	1.231	34	2.203	49	3.175	64	4.147	79	5.118	94	6.090	480	31.103
5	0.3240	20	1.296	35	2.268	50	3.234	65	4.211	80	5.183	95	6.155	500	32.396
6	0.3888	21	1.361	36	2.332	51	3.304	66	4.276	81	5.248	96	6.220	600	38.875
7	0.4536	22	1.426	37	2.397	52	3.369	67	4.341	82	5.313	97	6.285	700	45.354
8	0.5184	23	1.490	38	2.462	53	3.434	68	4.406	83	5.378	98	6.350	800	51.833
9	0.5832	24	1.555	39	2.527	54	3.499	69	4.471	84	5.442	99	6.414	900	58.313
10	0.6480	25	1.620	40	2.592	55	3.564	70	4.535	85	5.507	100	6.479	960	62.207
11	0.7130	26	1.685	41	2.656	56	3.628	71	4.600	86	5.572	120	7.776	1000	64.792
12	0.7776	27	1.749	42	2.721	57	3.693	72	4.665	87	5.637	150	9.719		
13	0.8424	28	1.814	43	2.786	58	3.758	73	4.730	88	5.702	180	11.664		
14	0.9072	29	1.869	44	2.851	59	3.823	74	4.795	89	5.766	200	12.958		
15	0.972	30	1.944	45	2.916	60	3.888	75	4.859	90	5.831	240	15.552		

WEIL'S DISEASE (Acute Febrile Jaundice, Infectious Jaundice, Bilious Typhoid). Etiology.—Males, young or middle-aged, especially laborers, brewers and butchers, are the subjects as a rule. Exposure to cold may be an exciting cause. It is most common in the summer and occurs in groups of cases. Probably it is caused by more than one microorganism.

Symptoms.—The onset is generally sudden, with a chill, followed by fever, headache, nausea, general pains and epigastric pain. Jaundice appears early. The liver and spleen are enlarged and may be tender. The stools may be clay-colored. The urine is dark and contains bile pigment, sometimes albumin and casts and blood. Fever lasts from 8 to 14 days and is remittent in character.

Diagnosis.—Bilious malarial fever may be excluded by the absence of plasmodia in the blood. The presence of fever, muscular, joint and epigastric pain distinguish it from catarrhal jaundice. Acute yellow atrophy of the liver and phosphorous poisoning are excluded by the mild course and favorable outcome.

Prognosis is generally good.

Treatment is symptomatic.

WERNICKE'S SIGN (Hemiopic Pupillary Inaction).—If a bright light is thrown into the eye and the pupil reacts, the integrity of the reflex arc is demonstrated. It is possible, in cases of lateral hemianopsia, to throw the light into the eye so that if falls upon the blind half of the retina. If, when this is done, the pupil contracts, the indication is that the reflex arc referred to is perfect, by which is meant that the optic nerve-fibers from the retinal expansion to the center, the center itself, and the third nerve are uninvolved. In such a case the conclusion would be justified that the cause of the hemianopsia was central; that is, situated behind the geniculate bodies, either in the fibers of the optic radiation or in the visual cortical centers. If, on the other hand, when the light is carefully thrown on the hemiopic half of the retina, the pupil remains inactive, the conclusions are justifiable that there is interruption in the path between the retina and the geniculate bodies, and that the hemianopsia is not central, but is dependent upon a lesion situated in the tract. See Hemianopsia.

WET PACK.—See Pack.

WHEY.—The liquid part of milk separating from the curd in coagulation. **Alum whey** is separated by stirring milk with a lump of alum; a popular remedy for sore eyes.

Wine whey is prepared by adding Rhine wine, 1 part, to hot milk, 4 parts, and straining. See Infant Feeding. **Whey cure,** a cure for chronic catarrh of the respiratory organs. This consists in drinking warm whey, either alone or mixed with a mineral water, in definite quantities at set times. About 20 ounces are taken daily. This is regarded by many as in all respects similar to the use of skimmed milk. Sometimes the method is combined with baths of whey.

WHISKY.—See Alcohol; Spirits.

WHITE SWELLING.—See Joints (Diseases) (Tubercular Arthritis).

WHITES.—See Leukorrhea.

WHITLOW.—See Paronychia.

WHOOPING-COUGH (Pertussis).—A highly contagious disease, characterized by inflammation of the respiratory tract, associated with a peculiar spasmodic cough ending in a whooping inspiration.

Etiology.—The organism causing whooping-cough has not yet been agreed upon though a number have been reported. A bacillus described by Bordet and Gengou, similar to that of influenza, has apparently some claims. This disease is directly very contagious, next to measles probably the most so of any of the infectious diseases, and it is possible for it to be carried by a third person. One attack usually protects from a second. It is most likely to occur before the tenth year; and although infants are not so susceptible as older children, it frequently does occur at that period of life, and is then a fatal disease.

Pathology.—There are no characteristic pathologic lesions due to whooping-cough, but postmortem there are found—besides the catarrhal condition, which is always present to some extent—lesions due to complications.

Symptoms.—The period of incubation is from

4 to 14 days, during which time there are no symptoms to indicate the onset of the disease. In the clinical course three stages are usually noticed: viz., the catarrhal stage, the paroxysmal stage, and the stage of decline. The first symptoms are those of a slight bronchial catarrh, which is worse at night. The cough is of a laryngeal type, and has a peculiar ring.

The child at this time has some fever, the appetite is poor, and the sleep is restless. The cough gradually increases, and after a few days is out of proportion to the physical signs, only a few dry râles being found on examining the chest. The physiognomy changes, the face becomes swollen, the eyes are suffused and the under lids are swollen and pink in color. This characteristic of the under lids may be recognized before the whoop appears, and is a valuable diagnostic sign. During the paroxysmal stage, which begins about the second week, the cough becomes spasmodic. The child often has a premonition of the onset of a spasm, and will run to its mother or nurse or grasp a chair in its efforts to be relieved.

The paroxysm consists of a number of short, spasmodic expiratory coughs, succeeded by a long-drawn inspiration and the peculiar whoop. Drinking, eating, crying, or any excitement will often bring on an attack. There may be 3 or 4 paroxysms in rapid succession, followed by a period of several hours when the child apparently feels as well as usual.

The attacks of coughing are frequently followed by eructations of stringy mucus, which may be streaked with blood, and vomiting of mucus and of the food which has been eaten is quite common.

Nose-bleed is not unusual during this stage, and there may be ecchymoses, giving the skin a livid appearance. Extravasation of blood under the conjunctiva may occur, and the pink color and swollen appearance of the lower lids are more characteristic than during the catarrhal stage.

The physical signs of the chest are not characteristic. Between the attacks of coughing the child may play about and may seem as well as usual. The patients, however, as a rule, suffer more or less from malnutrition and weakness, and young infants frequently from gastrointestinal disturbances, which may prove a dangerous complication.

The number of paroxysms vary; usually, one occurs about every hour, or there may be as many as 30 or 40 in the course of the 24 hours. In young children the whoop may be absent. This is also noticed when pneumonia occurs as a complication, but the whoop appears again as the lungs clear. Long after an attack of whooping-cough is over the paroxysms may occur again and again, being brought on by a slight cold or by catarrh of the respiratory tract. The paroxysmal stage continues for a period of 3 or 4 weeks or longer.

The third stage, or stage of decline, begins when the cough grows less in intensity. The sputum is then not so tenacious, but becomes purulent. The cough is less violent, and occurs at less frequent intervals. This stage continues for 2 or 3 weeks.

Complications.—In infants convulsions are common when the cough is most severe; they are apt to be general and severe, and often prove fatal. At times vomiting becomes a serious complication, and it may reduce the child's strength to such a point as to endanger life. Severe bronchitis and bronchopneumonia occur quite frequently, and are dangerous complications. Adenoids greatly increase the dangers.

Diagnosis.—Until the whoop appears it is frequently impossible to make a diagnosis; but the troublesome cough, especially at night, and the absence of physical signs to account for it, with the peculiar puffy appearance of the face and the swollen and pink under eyelids, previously mentioned, are quite positive signs. A simple catarral laryngitis may sometimes simulate pertussis, but there is no distinct whoop, and the symptoms do not progressively increase and continue for a long period, as in the latter disease. Vomiting at the end of a paroxysm is a most suspicious symptom of whooping-cough.

Prognosis.—The older the child, the more favorable the prognosis. As stated, pertussis in infants is a very serious affection, the mortality being 25 percent in the first year. Children who are debilitated and poorly cared for also suffer severely from this disease. If between the paroxysms the child is well, the prognosis is very favorable; but if fever, accelerated breathing, somnolence, and persistent intestinal catarrh are present, the outlook is unfavorable. As a rule, whooping-cough is not a fatal disease, but the tendency to complications and the appearance of sequels affecting the lungs make it necessary to watch every case with care.

Treatment.—The child should be isolated during the whole course of the disease. The hygienic treatment of pertussis is very important, and all cases should receive careful treatment, as the attack may thus be shortened, and the danger of serious complications may be rendered much less.

The patient should be surrounded constantly by fresh air, to accomplish which it is of advantage to have two rooms, airing one while the other is being occupied. The room should be kept at a uniform temperature of about 65° F., and the child should be protected from drafts while sleeping by placing mosquito-netting over the bed or crib. On pleasant days that are not windy it is an advantage to keep the child in the open air as much as possible.

Careful attention should be paid to feeding, especially in infants, whose nutrition is so easily interfered with. They should be nursed regularly if at the breast, and if fed by the bottle, should receive a properly modified milk diet. When vomiting follows a paroxysm of coughing and causes the food to be ejected, another feeding should be given at once. Small quantities at frequent intervals are more likely to be retained than the usual amount every 2 1/2 or 3 hours.

In the treatment of this disease it is important that it be recognised early.

During the catarrhal stage it is a local affection, and treatment locally at this time will in many cases shorten the duration. For this purpose the following formula is valuable to sterilize the throat and nose:

℞.	Hydrogen dioxid, Glycerin, } each,	℥ ss
	Water,	℥ iij.

Spray thoroughly through the nares every 4 hours.

When the cough is fully established and is accompanied by eructations of stringy mucus, mixture of asafetida, in 1/2 teaspoonful doses every 2 hours, should be given. Belladonna is a very useful remedy, and should be given in doses sufficient to cause flushing of the face. The tincture of belladonna may be given every 3 or 4 hours, in doses of one drop for each month of the child's age, gradually increasing the dose until toxic effects are produced. The dose of atropin may be more easily regulated, and it may be given instead of belladonna, giving from 1 to 5 drops of the following every 3 or 4 hours:

℞.	Atropin sulphate,	gr. j
	Water,	℥ j.

In young infants a belladonna plaster placed between the scapulæ will often give good results.

Antipyrin combined with belladonna seems to have a more favorable action than either drug alone:

℞.	Antipyrin,	ʒ j
	Tincture of belladonna,	ʒ iv
	Brandy,	ʒ iv
	Water,	℥ iij.

Give 1/2 to 1 teaspoonful every 4 hours to a child 3 or 4 years of age.

Bromoform may be given to quiet the cough:

℞.	Bromoform,	gr. x
	Alcohol,	ʒ j
	Simple syrup,	ʒ iv
	Water,	℥ ijss.

To a child 2 or 3 years old give 1 teaspoonful every hour until quiet.

Inhalations of quinin solution or of oxygen or of ethyl iodid are recommended.

During convalescence, if the indications seem to demand tonics, cod-liver oil, syrup of iodid of iron, syrup of hydriodic acid, etc., should be given, and the child should be as much as possible in the open air, preferably at the seashore.

Serum or vaccine therapy has proved valuable in the hands of several observers.

WIDAL REACTION.—See TYPHOID FEVER.

WILD CHERRY.—See PRUNUS VIRGINIANA.

WINE.—The fermented juice of various species of *Vitis*. A sweet wine is one in which a notable portion of the original grape-sugar of the must has escaped fermentation, or to which an addition of sugar has been made subsequent to the main fermentation. A dry wine is one in which the sugar, whether originally present or subsequently added, has almost all undergone change in the processes of fermentation. A sparkling wine is one in which a supplementary fermentation is purposely developed subsequent to the bottling, whereby quantities of carbon dioxid are developed and held dissolved under pressure. See VINUM. **W., Barley**, beer. **W.-blue**, the coloring-matter of red wines, a blue substance similar to litmus, possessing the property of turning red in the presence of acids. **W., Burgundy**, a heavy red or white wine from Burgundy, France. **W., High**, commercial ethyl-alcohol. **W., Low**, the products of the first distillation. **W., Maderia**, a heavy wine from the island of Maderia, having a nutty flavor. **W., Malaga**, a sweet wine from Malaga, in Spain; it contains between 13 and 14 percent of alcohol. **W., Milk**, fermented milk. **W., Moselle**, a light wine from the valley of the Moselle, in Germany. **W., Mulled**, a preparation made by adding eggs and spices to wine and then heating it. **W., Oil of.** See W., Heavy Oil of. **W., Heavy Oil of**, ethereal oil. **W., Light Oil of**, etherol, a yellowish liquid of a peculiar odor obtained from ethereal oil. **W., Port**, a heavy wine from Oporto, Portugal. **W., Raisin**, wine consisting mainly of a fermented infusion of raisins; it contains also the fermented juice of fresh grapes, sugar, and tartaric acid. **W., Red.** See VINUM RUBRUM. **W., Sherry**, a heavy wine from the region of Xeres, in Spain; it is white or brown in color. The sherry wine often marketed seldom contains any wine, but consists of alcohol, water, and flavoring ingredients. **W., Spirit of**, ethyl-alcohol. **W., Whey**, a nutritious and slightly stimulating preparation used in adynamic states. It is made of white wine and milk, from 2 to 8 ounces of the former being added to a pint of the latter at the boiling temperature; the whey is then strained off and sweetened. **W., White.** See VINUM ALBUM.

Heavy wines are wines containing more than 12 percent by weight of alcohol. **Light wines** are wines containing less than 12 percent by weight of alcohol, as claret, Sauterne, or Moselle.

WINKING.—See NICTITATION.

WINTERGREEN.—See GAULTHERIA.

WITCH-HAZEL.—See HAMAMELIS.

WITNESSES, MEDICAL.—See EXPERT TESTIMONY.

WOLF'S-BANE.—See ACONITE.

WOMB.—See UTERUS.

WOOL-SORTER'S DISEASE.—See ANTHRAX.

WORD-BLINDNESS.—See APHASIA

WORMS.—The worms that are parasitic in man are the *flat worms*, and the *round worms*.

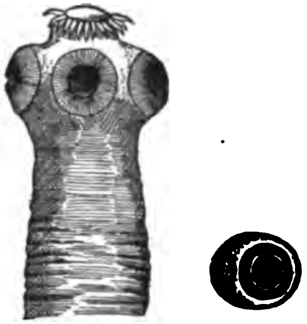
Flat worms (plathelminthes) are subdivided into the fluke-worms (trematodes) and the tape-worms (cestodes).

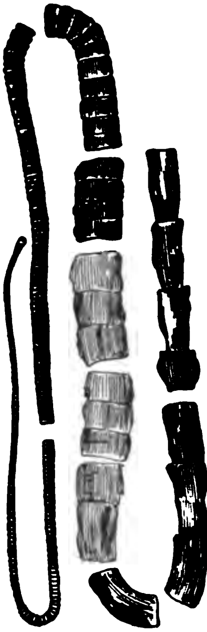
Fluke-worms (trematodes).—The chief worms of this order are: (1) The distomum hepaticum (liver fluke). See DISTOMIASIS. (2) The distomum heterophyes (Egyptian intestinal fluke). (3) The Schistosomum hematobium (African blood fluke). (4) The schistosomum Japonicum (Asiatic blood fluke). See SCHISTOSOMIASIS.

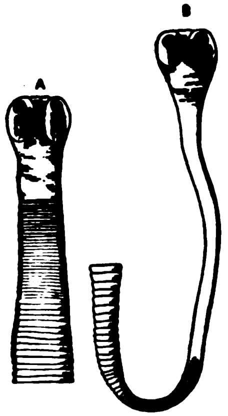
Tape-worms or Cestodes.

To this order belong (1) the tænia solium; (2) the tænia saginata; (3) the bothriocephalus latus; (4) the tænia echinococcus, the larval stage of which forms the hydatid cyst. See Liver; Hydatid Cyst; (5) the tænia nana (dwarf tapeworm) of southern Europe.

The tænia solium, the "armed tape-worm," is the most common in this country. It is derived from the embryos contained in pork, known as the cysticercus cellulosæ. It is from 6 to 30 feet in length, and has a globular head, or scolex, and a slender neck, connecting its numerous flat segments or joints. The head, or scolex, measures about 1/40 inch, has a double circle of hooklets—whence the term "armed tape-worm"—and is provided with from 2 to 4 suckers. The segments or joints (strobila) are flat, and vary from 1/8 to 1/2 of an inch in length. Each segment contains both male and female sexual organs, the uterus being a long, numerously branched tube, in which the ova develop. The ovum measures about 1/1700 inch in diameter. An ordinary tapeworm contains some 5,000,000 ova. The parasite is firmly embedded in the mucous membrane of the upper third of the small intestines by its hooklets and suckers. The lower or terminal segments represent the adult and complete animal, and are termed the proglottides; these separate from the parasite and are discharged either alone or with the feces.


Head and Egg of Tænia Solium.

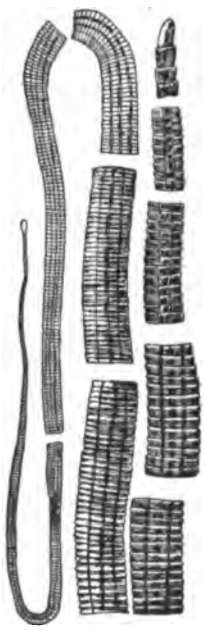

Tænia Saginata.

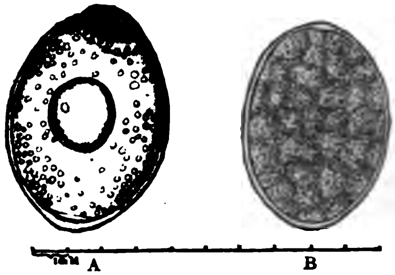


Cephalic End of Tænia Saginata; A. Retracted head. B. Extended head.

The tænia saginata, the "unarmed tape-worm"—a not uncommon variety—is derived from the embryos contained in beef, known as cysticercus bovis. This worm is from 10 to 40 feet in length, has a rounded or oval-shaped head that measures about 1/10 of an inch, and has 4 strong and prominent suckers, but no hooklets—whence the term "unarmed tape-worm"; the neck is short and thick and the segments are larger, stronger, and thicker than those of the tænia solium.

The bothriocephalus latus (fish tape-worm, tænia lata), also an "unarmed tape-worm," the largest parasite infesting man, is supposed to be derived from an embryo found in fish. The embryo, or ovum, is introduced into the intestinal canal with the food and drink. The parasite reaches its final growth after its entrance into the intestines. Those handling fresh meats or those eating uncooked animal food are most liable to be affected. Uncleanliness is also an important factor. This worm is larger than the tænia solium and the tænia saginata, the length ranging from 15 to 60 feet; the head is oval, measuring about 1/10 inch; the neck is short, and the segments or joints are nearly three times as broad as they are long. Its color is a dull, bluish-gray. Zoologically considered, this variety is not a true tapeworm.


Bothriocephalus Latus.—(*Leuckart.*)



Ova of Bothriocephalus Latus.

A, after treatment with sulphuric acid so as to render lid apparent; B, natural appearance in fecal matter.

Symptoms.—Not infrequently a tænia produces no symptoms whatever. Usually, however, there are colicky pains throughout the abdomen, inordinate appetite, disorders of digestion, emaciation, constipation, attacks of cardiac palpitation, faintness, disorders of the special senses, and pruritus of the anus and nose. Any or all of these symptoms may be present. A large meal will often remove the majority of the symptoms. In a great many cases the discovery of the segments is the first intimation of the presence of the parasite.

Treatment.—Many remedies have been suggested for the tape-worm. Pomegranate, pepo, male-fern, creosote, glycerin (2 drams to 1 ounce), pelletierin tannate (10 to 20 grains), have all been used. The following is often successful:

℞. Chloroform,
Fluidextract of male-fern, } each, ʒ j
Emulsion of castor oil, ℥ iij.
To be taken in the early morning with no food to follow until there has been thorough action of the bowels.

Another successful plan is to boil pomegranate seeds (2 ounces) in 1 pint of water down to 7 ounces; add pumpkin seeds (1 ounce), deprived of their outer coats and beaten to a paste with finely powdered sugar; to this add oleoresin of male-fern (30 grains) made into an emulsion with acacia, and flavored with syrup enough to make 9 ounces. One-third of this mixture is to be taken after a light diet in the morning, a laxative having preceded it the previous day. A second and a third portion are to be taken at intervals of 3 hours, if not previously successful. The worm should be passed while sitting in a warm sitz-bath, in order that the weight of the expelled portion may not break off before the expulsion of the head. It is important to remove the head. See ANTHELMINTICS.

Round-worms or Nematodes.

1. Angiostomidæ to which species belong the tropical *strongyloides intestinalis*. This worm has been encountered in the Southern States. The presence of large numbers of this species may induce enteritis and anemia. They may be expelled by ethereal extract of male fern.

2. Filariidæ. See FILARIASIS, GUINEA-WORM DISEASE.

3. Trichotrachelidæ, which includes the *trichiuris trichiura* (trichocephalus dispar, whip-worm) one of the most common and least harmful of intestinal parasites, and the *trichina spiralis* the encysted larvæ of which lodge in the muscles. See TRICHINIASIS.

4. Strongylidæ, to which belong the *Uncinaria*, U. duodenalis (European hook-worm), U. Americana (American hook-worm). See HOOK-WORM DISEASE.

5. Ascaridæ, which includes the *ascaris lumbricodes* (the common round-worm of children) and the *oxyuris vermicularis* (pin-worm, thread-worm, seat-worm).

The ascaris lumbricoides is one of the most common parasites affecting the human body, and develops in the intestines, either after the entrance of the ova of the same or from the so-called "intermediate parasites." Their entrance is effected by means of food and drink. The ascaris is of a brown color, and has a cylindric body from 10 to 20 inches in length and 1/8 to 1/4 inch in circumference; the head terminates in 3 semilunar lips, each having about 200 teeth. The ova are oval-shaped, are produced in immense numbers—some 60,000,000 in a mature female—and have wonderful vitality, resisting extreme heat or cold. Round-worms inhabit principally the small intestines, although they often migrate to other parts. From one to several hundred worms may be found.

Symptoms.—The ascaris lumbricoides may be present in great numbers and yet produce no characteristic symptoms other than those of gastric and intestinal irritation, such as picking the nose, foul breath, colicky pains, nausea and vomiting, diarrhea, and disturbed sleep—tossing from side to side of the bed and grinding the teeth. Any or all of these symptoms may be present or absent; a positive diagnosis may be based upon the passage of the parasite, which is often the first thing to call attention to the condition. The presence of 1 or 2 round-worms may cause no symptoms *per se*. Round-worms have been discharged from abscesses in the abdominal wall, and have obstructed the bile-duct and found their way into the peritoneal cavity.

ASCARIS LUMBRICOIDES AND EGGS.—(*Coplin and Bevan.*)

Treatment.—The fluidextract of spigelia, the fluidextracts of spigelia and senna combined, the oil of chenopodium, the infusion of brayera or kousso, and santonin are the drugs usually employed against the ascaris. One dram of spigelia and from 2 to 3 drams of spigelia and senna, in divided doses, may be given to a child of 3 years. From 5 to 20 drops of the oil of chenopodium may be given on lumps of sugar.

℞. Powdered leaves of brayera, ℥ ss
Mucilage of acacia,
Water, } each, ℥ viij.
To be taken at one dose, for an adult.

The fluidextract of brayera may be given in a dose of 1/2 ounce to an adult. Koussin may be given in 40-grain doses in capsule to adults, save to pregnant women.

When used alone, vermifuges should be followed by a full dose of castor oil, or by a saline purge.

The usual remedy is santonin combined with calomel. The following prescription may be given overnight, and castor oil or citrate of magnesia or some saline purgative may be given the next morning before breakfast:

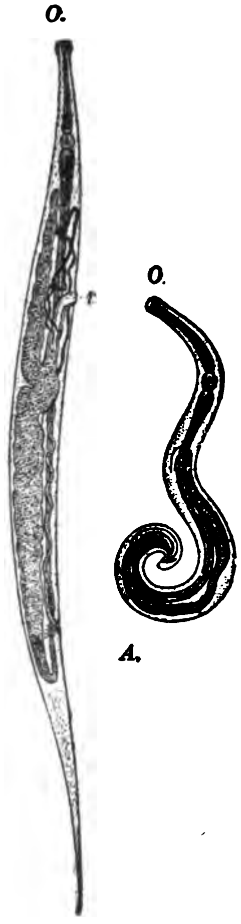
℞. Santonin, gr. j to iij
Calomel, gr. ss to j.

The santonin may be dissolved in 2 or 3 teaspoonfuls of castor oil and given before breakfast. It should not be repeated more than twice, until the physiologic effects have passed off. Smaller doses should be tried if ordinary santonin administration causes poisoning, or compound scammony powder may be substituted.

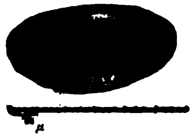
Whenever a round-worm is to be attacked, the patient should not be given solid food for from 12 to 24 hours before, so that no residue in the intestinal canal may protect the worm. A small quantity of milk may be taken, and the anthelmintic should be given in the morning, after a night of fasting. See ANTHELMINTICS.

The oxyuris vermicularis develops in the large intestines, either from its peculiar ova or from the so-called "intermediate parasites," these latter finding their way into the bowel with the food and drink or by direct contact. The oxyuris resembles an ordinary piece of white thread, measuring from 1/6 to 1/2 of an inch in length, the head terminating in a mouth with three lips, the tail terminating as a sharp point. The ova are oval, are produced in large numbers —each female containing about 10,000—and are surrounded by a stout envelope, which increases their vitality. The seat-worm, as its name indicates, inhabits the large intestines, especially the rectum, although it frequently migrates to the sexual organs. The worms vary in number, sometimes the parts infested being entirely covered.

Symptoms.—The oxyuris produces intense itching about the anus, with a desire for stool, the passages often containing much mucus, the result of the irritation produced by its presence. Should the worms migrate to the sexual organs, intense itching of these parts results, which in children, unless speedily corrected, leads to masturbation.



OXYURIS VERMICULARIS, to the left, female: to right, male (considerably enlarged). *A*, anus: *O*, mouth: *V*, vulva.—(*Braun, after Claus.*)



OVUM OF OXYURIS VERMICULARIS.

Treatment.—Santonin and calomel, with the use of enemata of quassia, alum, sodium chlorid, or phenol (5 grains to 1 pint of water) according to the age, the injection not to be retained; or an enema of a weak solution of mercuric chlorid (1:10,000). All medicated enemata should be preceded by a large injection of water to unload and clear the rectum. Washing the anus and external genitals with a solution of carbolic acid should also be employed. For the pruritus ani a mercurial ointment is useful. See ANTHELMINTICS.

WOUNDS.—**An incised wound** is a division of the parts, more or less extensive according to the extent of the injury. The fibers have only been simply divided; there is no contusion or laceration; hence they are not likely to take on severe inflammation, nor are they likely to slough or suppurate. By the extent and color of the hemorrhage the surgeon is enabled to judge of the kind of vessel injured: if an artery is wounded, the blood flows rapidly in jets and is of a florid color; if a vein, the bleeding is slow and the blood is of a purple color.

Treatment.—In a recent incised wound the indications are to check the bleeding, to remove all extraneous matter, and to bring the parts in perfect apposition. To check the hemorrhage, steady, and continued pressure upon the surface with a sponge wet with hot corrosive sublimate solution will be sufficient, as a general rule. Should the hemorrhage proceed from a vessel of some size, a ligature should be applied. As soon as the bleeding ceases all clots are to be completely sponged away and all foreign bodies must be carefully removed; the edges are then to be brought together in their entire extent and retained in contact by means of sutures. The wound being dressed, the parts must be placed at rest, in a relaxed position.

The wound must not be entirely closed. lest the secretions be retained; if this is allowed to take place, erysipelas may follow, and there will be risk of septicemia. Drainage must be provided for by means of drainage-tubes; they should be placed in the wound before it is closed, care being taken not to let them remain in too long. When the bloody serum ceases to flow, the tube must be removed, unless there is prolonged suppuration. The ligatures may be cut off short. The wound must be dressed antiseptically.

Lacerated wounds are those in which the fibers, instead of being divided by a cutting instrument, have been torn asunder by violence. The edges of the wound are ragged and irregular; there is little pain or hemorrhage, and the surrounding parts, frequently bruised and discolored, are cold and numb. A lacerated wound differs from an incised one in the mildness of the pain and hemorrhage; in its tendency to suppurate and slough; and in its liability to be followed by erysipelas, septicemia, pyemia, tetanus, and various nervous symptoms. When the lesion is very extensive, the attendant shock being necessarily severe, local sensation is obliterated; but when reaction takes place, the pain is frequently intense.

The treatment of lacerated wounds does not differ greatly from that of incised wounds. All foreign bodies must be removed, the torn vessels tied, and the edges of the wound gently approximated. Guard against secondary hemorrhage by applying, if possible, a provisional tourniquet to the part, to be tightened on the slightest appearance of blood. Great care must be taken to select a sound portion of the artery when the ligature is applied. Venous hemorrhage may generally be controlled by a compress and roller. All tension is to be carefully avoided, and the edges are to be trimmed with scissors and the wound closed with sutures, using drainage-tubes if necessary.

To moderate the inflammation, bichlorid irrigation is to be used, either warm or cold. Should suppuration present itself, spray the wound with peroxid of hydrogen, wash with corrosive sublimate solution, and dress antiseptically; and when the granulating process is established, apply a solution of 3 drops of nitric acid to 1 ounce of water; opium cerate or dilute ointment of nitrate of mercury may be employed. Should the inflammation run high and gangrene threaten, purgatives should be used and antiphlogistic regimen observed. Anodynes, to allay pain and produce sleep, must be freely given. Secondary hemorrhage may arise as soon as reaction takes place, or it may occur when the sloughs begin to separate; this will probably take place in 5 or 6 days from the date of the injury, and should be carefully guarded against, especially if a large artery is involved. Should tetanus set in, it should be promptly treated with anodynes, using opium, hyoscin, bromid of sodium, and chloral freely; blister the part, or paint it with tincture of iodin, or use cold bichlorid irrigation. See GANGRENE, SEPSIS, SUPPURATION, TETANUS, etc.

Contused wounds are usually produced by greater violence than produces lacerated wounds, and are accompanied by greater disorganization; blood is extravasated, cellular tissue is broken down, muscles are bruised, and the surrounding parts are apt to be disorganized. They bleed but little in consequence of the organization of the parts being destroyed. The pain that accompanies a wound of this kind is in inverse ratio to the extent of the injury. When there is a moderate contusion, the pain is generally severe; and when there is a violent degree of contusion, the patient scarcely suffers any pain until reaction sets in.

Treatment.—If there is hemorrhage, it is to be controlled in the usual manner—by compression, hot water, and ligatures. When an artery lies exposed in contused wounds, ligatures should be applied both above and below the point of lesion. The edges of the wound must be brought together gently, allowance being made for swelling and drainage. If it is necessary, sutures to bring the parts together may be used. The usual antiseptic dressings should be applied. When the inflammation is very active, leeches may be necessary. Pain and nervous symptoms are controlled by anodynes and antispasmodics. After the lapse of a few days, if the wound has healed, the part may be bathed with tincture of camphor, soap liniment, or dilute tincture of iodin.

Contusions producing subcutaneous injuries are caused by blows from a hard, blunt object or by violence applied to the injured part. The surface is not broken, but, as a rule, blood is extravasated under the skin. The injury is to the soft parts under the skin; the connective tissue with its delicate vessels primarily; then the muscles may be crushed or torn; next the lymphatics and arteries; the nerves show the most resistance, though they may be violently stretched.

Contusions vary in degree from a trivial bruise to absolute crushing of the part. In the slightest cases there is no perceptible bruise—mere redness and swelling, with local pain, which soon subsides; in those that are more severe there is ecchymosis, some of the capillaries being ruptured, and blood is effused into the skin or subcutaneous tissues, when swelling and discoloration make their appearance. In the worst cases the amount of extravasation may be enormous, as when a large vessel has been ruptured, or in persons in whom the tissue is easily torn. The scrotum or the loose cellular tissue of the female genitals may be swollen to an enormous size. The case may prove fatal almost at once from hemorrhage alone.

The changes that take place in the part depend upon the amount of extravasation, the tension, the nutrition of the surrounding tissues, and the treatment that the injured part has received. Absorption is the rule; but if the tension is great, as when a large artery is severed, or if the part is not kept at rest, or if the surrounding tissues are not sufficiently nourished, inflammation may ensue when suppuration is very likely to follow. The degree of swelling varies with the amount and situation of the extravasation and with the looseness of the tissues. As a rule, the pain depends upon the amount of tension. In some instances the shock is very severe, as when the testis is squeezed or the abdomen is struck. If a large vessel is torn, the loss of blood may at once prove fatal. When the bruise is superficial, the staining of the skin will soon show itself; when deep, it may not appear for weeks. Traumatic fever is a usual accompaniment, and in cases of large extravasations may be very severe, lasting for several days.

Treatment.—Slight contusions are best treated with cold or evaporating lotions. Lead-water and laudanum and acetate of lead in a decoction of powdered opium are especially useful. When the extravasation is considerable, uniform, gentle compression with many layers of cotton-wool checks the increase, limits the hyperemia, and promotes absorption. This treatment will be found efficacious even when bullæ are forming upon the skin. The fluid should be drawn off through a minute puncture, and absorbed with cotton-wool or thick blotting paper; the epidermis should then be carefully replaced and a little iodoform dusted on or collodion painted over, and then cotton-wool carefully applied. In very severe cases when there is risk of suppuration, the tension may be relieved by the aid of the aspirator. Only a small portion of the fluid need be removed—sufficient to relieve the tension; this will at once diminish the hyperemia, when absorption will proceed unchecked.

The contusion is sometimes so severe as to destroy the skin. If the injury is small, and the deep structures are not badly implicated, the slough should be allowed to separate itself; but when the skin has been stripped off from the subcutaneous tissue to some distance above the apparent seat of injury, and it is thought advisable to amputate, the line of incision must be carried well above, or the flaps will be sure to slough.

A punctured wound is one made with a narrow-pointed instrument, such as needles, nails, splinters, swords, bayonets, scissors, hooks, etc. These wounds are much more dangerous than cuts or incised wounds, from the effects they produce on the injured part.

A slight punctured wound through the skin into the cellular tissue will sometimes be followed by red lines along the course of the absorbent vessels, from the wound to the absorbent glands. If a tendinous structure is punctured, alarming symptoms will frequently follow. In punctured wounds their depth is usually much greater than their width, making it frequently difficult to determine the amount of injury inflicted. The pain is often very great, depending upon the injury sustained by the nerves. Punctured wounds are rarely attended with much hemorrhage, and sometimes with practically none. They are very liable to be followed by erysipelas, lymphangitis, abscess, and wasting of the muscles.

The treatment consists in the extraction of foreign substances, in checking hemorrhage, in moderating inflammation, and in preventing the development of nervous symptoms. All such articles as fish-hooks and similar barbed substances must be extracted by counter-openings or by pushing them through the part in which they may be embedded. If bleeding arises by reason of an artery having been laid open, it must be exposed and tied at both ends. An anodyne should be admininstered and the parts should be dressed antiseptically. Great care must be exerted to see that full and sufficient drainage is established. It is always safe, and frequently absolutely necessary, to change a punctured wound into an incised wound by free incisions.

Gunshot wounds are injuries caused by substances discharged from firearms, by fragments of stone or wood struck thereby, and by the bursting of firearms and shells. See GUNSHOT WOUNDS.

Dissection wounds are those contracted in the examination of dead human bodies. The first symptom that attracts attention is a stinging or burning sensation; upon examining the part a little whitish vesicle is observed, extremely sensitive on pressure. When the vesicle breaks, a small ulcer is exposed. The pain by this time is very great, the sore enlarges, the swelling increases, and the part is hot, tense, and numb. A red line is usually seen, extending, from the point of inoculation along the arm to the axilla. As the disease spreads the whole limb becomes enormously enlarged, pitting on pressure and looking dusky and erysipelatous. Cases occur in which the symptoms begin at the axilla and extend thence up the neck and down the side. In the worst forms the disease soon reaches a crisis, the system rapidly falling into a typhoid state.

Treatment.—As soon as a wound of this kind is received, it should be thoroughly washed with warm water and soap; this should be followed by suction by the mouth. If the wound is small, it should be dilated; if it has bled, it should be thoroughly cauterized with acid nitrate of mercury, nitrate of silver or hydrochloric, nitric, or sulphuric acid. If a vesicle forms, it should be freely opened, and then thoroughly cauterized; antiseptic dressings should be applied, and, if necessary, a purgative should be administered. To relieve the severe pain and the restlessness, anodynes should be freely employed, and if the skin is hot and dry, aconite or veratrum viride should be administered. To meet the typhoid symptoms, milk-punch, quinin, iron, and such other treatment should be resorted to as will support and sustain the patient.

Wounds of the various members, regions, and organs are considered under their respective headings. See ABDOMEN (Injuries), NECK (Injuries), KIDNEY (Injuries), etc.

Listerian Methods of Dressing Wounds.—Carbolic acid was the first antiseptic, but from its volatility and slowness of action as a germicide it was replaced by corrosive sublimate. But this proved irritating, and was precipitated by the albumin of the blood-serum.

What might be called the **third method** was the antiseptic dressing called **serosublimate gauze,** consisting of a gauze charged with a solution of corrosive sublimate in the serum of horses' blood. This was found difficult to manufacture, and was harsh and nonabsorbent.

The fourth method consisted in a combination of chlorid of ammonium and bichlorid of mercury, called **sal alembroth.** This was likewise objectionable because of its ready solubility in the blood-serum.

Fifth method, a gauze containing 3 or 4 percent by weight of the biniodid of mercury. This proved irritating to the skin.

A sixth method consists in the employment of gauze impregnated with a solution of a double cyanid of zinc and mercury colored with a dye. This is said to be nonvolatile, unirritating, insoluble in water, and only soluble in 3000 parts of blood-serum. It possesses but little germicidal power, while but 1:1200 keeps animal fluids free from putrefaction.

Lister's antiseptic dressing has a base solution of bichlorid of mercury, 1:4000, with small quantities of potassium cyanid, mercuric cyanid, and zinc sulphate added.

Dissolve the two cyanids in 2 ounces of distilled water and add the zinc sulphate dissolved in 6 ounces of distilled water; collect the precipitate (which will be thrown down) upon a filter, and wash thoroughly by pouring over it (while still in the filter) distilled water. While the precipitate is still moist, diffuse it in 8 ounces of distilled water. Dissolve the hematoxylin in 1 1/2 drams of distilled water, to which the ammonia has been added. Add this to the precipitate diffused in the water, allow to stand for 3 hours, then add the whole to the solution of bichlorid of mercury. Draw the gauze through this. The dye salt will settle upon the gauze and fix the cyanid. The gauze should be hung upon an antiseptic cord to drain. When it is nearly dry, remove and place in a tightly stoppered glass jar. The superfluous moisture can be removed by pressing the gauze between the layers of a sheet if needed for immediate use.

Seventh Method.—Lister returned to the use of carbolic acid, preferring it to corrosive sublimate: (1) because it is a more powerful antiseptic; (2) because it has greater penetrating power. He combined it with the use of the double cyanid gauze, preparing the latter with a 1:20 solution of carbolic acid.

Antemortem and Postmortem Wounds.—A wound inflicted during life is generally characterized by hemorrhage, coagulation of the blood, eversion of the edges, and retraction of its sides. It may also be inferred that the wound was inflicted during life if any of the following are noticed: The presence of inflammation, swelling, pus, or gangrene on the edges of the wound, or if there is any sign of beginning cicatrization.

WRIST-DROP.—See Lead (Poisoning).

WRIST-JOINT, DISLOCATIONS.—These injuries are very rare, and are caused by falls on the hand with the hand in a very decided dorsal or volar flexion. Most of the cases formerly diagnosed as dislocation are now known to be typical fracture of the radial epiphysis (Colles' fracture). See Forearm (Fracture).

Dislocation may be backward or forward, and the carpal projection and deformity will correspond. Careful palpation will determine the diagnosis, the similarity to fracture being the greatest difficulty. In both varieties traction and direct pressure will effect reduction.

Dislocation of the radioulnar articulation rarely occurs, and is caused by twists.

WRY-NECK.—See Torticollis.

X

XANTHELASMA.—See Xanthoma.

XANTHIN.—$C_5H_4N_4O_2$. A leukomain found in nearly all the tissues and liquids of the animal economy, and in many plants; also in minute quantities as a normal constituent of urine. It is formed, at the same time with adenin, guanin, and hypoxanthin, in the decomposition of nuclein by dilute acids. Guanin is convertible into xanthin, which is thought to be one step lower as an intermediate product of nuclein decomposition, and nearer the uric acid limit of oxidation. It probably is oxidized in the body as fast as it is formed. It is a colorless powder, almost insoluble in cold water, but readily soluble in dilute acids and alkalies. It is nonpoisonous and is a muscle stimulant, especially of the heart. See Leukomains.

XANTHOMA (Xanthelasma).—A form of new-growth of the skin, occurring as plaques embedded in the skin, or as nodules from the size of a pin's head to that of a bean, rarely larger. The color is yellow, usually the tint of chamois leather. The plaques are slightly raised above the surface, but are scarcely perceptible to the touch when pinched. They are frequently seen in the form of plates embedded in the eyelids, especially in persons past middle age who have been subject to migraine. **X. diabeticorum** (lichen diabeticorum), a rare disease of the skin, always associated with diabetes mellitus. It develops rapidly and sometimes intermittently; the lesions are denser and firmer than those of true xanthoma, and are dull red, discrete, and solid, though at the apex they present a yellowish point, like pus. They are abundant on the scalp and face, but never exist on the eyelids, nor are they ever associated with jaundice. Itching and tingling are always present. **X. lineare vel striatum,** a form of xanthoma planum in which the lesions occur in lines or striæ. **X. maculatum et papulatum,** a form of xanthoma planum in which the lesions occur in papules and macules as well as in plaques. **X. multiplex,** a form occurring usually in women about middle life. It is frequently hereditary, and is usually associated with jaundice, which, as a rule, precedes it by a year or more. The lesions are generally distributed. **X. palpebrarum.** See X. Planum. **X. planum** (xanthoma palpebrarum), the commoner form of xanthoma, usually situated on the eyelids. **X. tuberculatum, X. tuberosum,** a rarer form of xanthoma, characterized by tubercular lesions upon the extensor surfaces of the extremities and on parts exposed to pressure, as the elbows and knees, shoulders, buttocks, backs of fingers and toes, and palms and soles. The lesions vary from the size of a hemp-seed to that of a pea, are hard to the touch, deeply set in the skin, and project prominently from it. They may coalesce and form veritable tumors. The disease is a chronic one.

XANTHOXYLUM (Prickly-ash).—The dried bark of *X. americanum.* It contains an acrid, green oil, a small quantity of tannic acid, two resins, and the alkaloid *Xanthoxylin,* which is probably identical with Berberin. Dose, of the powdered bark, 10 to 45 grains. It is a stimulant and aromatic bitter sialogog, diaphoretic, diuretic, and emmenagog. It increases cardiac actions and raises arterial tension. It is used in chronic rheumatism, myalgia, lumbago, catarrhal jaundice, dropsy, and chronic pharyngitis. Dose, of the fluidextract, 10 to 45 minims.

XERODERMA (Xerosis)—A congenital dryness, harshness, and roughness of the skin, commonly appearing within the first two years of life, unaccompanied by subjective sensations, and exhibiting to the eye a fine, scaly desquamation and a characteristic dull, grayish, yellowish, dirt-colored discoloration, chiefly involving the temples and the extremities. See Ichthyosis. **X. of Kaposi** a diffuse atrophy of the skin, idiopathic in origin. **X. pigmentosum** (atrophoderma pigmentosum; angioma pigmentosum atrophicum; melanosis lenticularis progressiva; Kaposi's disease), a very rare skin disease, beginning generally in summer and occurring during the second or third year of life. It is characterized by minute, measly, erythematous blotches upon parts exposed to the sun, which soon disappear, leaving pigment spots like ordinary freckles, which persist even during winter. A spontaneous atrophy of the skin then occurs, resulting in the formation of nonpigmented, glistening scar tissue, and, finally, in this tissue malignant, epitheliomatous growths form. Death generally results about puberty.

XEROFORM (Bismuth Tri-brom-phenol).—Is a patented preparation which contains about 50 percent of Bi_2O_3 and occurs as a yellow, insoluble powder, having a faint odor of carbolic acid. It is almost nontoxic and unirritating to mucous surfaces. It is an excellent surgical and intestinal antiseptic, and has been used locally with benefit in chancroids, buboes, foul ulcers, infected wounds, burns, eczema and other skin diseases. It has been given internally with satisfactory results in cholera, intestinal catarrh, and the summer diarrhea of children, also for chronic urticaria and certain forms of infantile eczema. Dose, 7 to 15 grains, three times a day. See Bismuth.

XEROSTOMIA (Dry mouth).—The result of a diminished secretion of saliva and mucus, and is apparently of nervous origin. It generally occurs in women over fifty years of age. The lips are dry and scaly, the tongue fissured like crocodile's skin, the cheeks and gums glazed and covered with crusts. The teeth are carious and slowly crumble away. The parotid glands become swollen and painful, and the skin dry and harsh. Frequently a similar condition is met with in the nose and conjunctiva. The patient, in addition to dryness of the mouth, complains of loss of taste, only a strong solution of quinin being perceived, or of subjective sensations as a salt flavor in the mouth.

Treatment.—Tonics and mouth-washes with removal of carious stumps, and the fitting in of suitable dentures Sialogogs, such as pilocarpin, are useless, perhaps harmful.

X-RAYS.—See ROENTGEN RAYS.

Y

YAWS.—Frambesia; pain; polypapilloma tropicum; amboyna button; parangi; coco; endemic verrugas. A tropical contagious disease of the skin, of long duration, characterized by dirty or bright red raspberry-like papules and nodules, tubercles, which undergo ulceration, appearing usually on the face, toes, and genital organs. It is most frequent in young colored people. Treatment does not differ from that of other tubercles of the skin.

YEASTS.—Blastomycetes or saccharomycetes are responsible for fermentation in many forms and are the cause of blastomycosis (*q. v.*) Cerevisin, the spores of the saccharomyces cerevisiæ, is claimed to be beneficial in furunculosis.

YELLOW FEVER.—An acute, specific infectious disease, remarkably limited in its geographic distribution. It is prevalent chiefly in tropical and semitropical regions. Upon the western hemisphere it occurs along the shores of the Gulf of Mexico and of the Caribbean Sea and in adjacent islands, and along the Southern Alantic coast of the United States, extending into the interior of the Southern States along railway lines and navigable rivers. In South America it appears on the Atlantic coast as far south as Montevideo and on the Pacific coast in Peru. In Africa it is limited to the west coast and contiguous islands; in Europe, almost exclusively to the Iberian peninsula. So far, the continents of Asia, Australia, and Polynesia have been exempt. Endemic foci exist now principally upon the island of Cuba, at Rio de Janeiro, and upon the Senegambian coast.

Yellow fever is characterised by a fever of sudden onset, of short duration (3 to 5 days), and of one paroxysm.

Etiology.—Recent experiments carried on in Cuba under the auspices of the medical department of the United States army demonstrate the rôle of the mosquito in disseminating yellow fever infection.

The specific organism that is the cause of this disease has not yet been demonstrated. The bacillus icteroides of Sanarelli, and the bacillus of Sternberg, have both been rejected. The stegomyia fasciata serves as the intermediate host for the unknown parasite. See MOSQUITOES. The disease is not conveyed by fomites. About 12 days or more must elapse before the contaminated mosquito is capable of infecting. In the absence of the stegomyia fasciata, as has been demonstrated, yellow fever is not contagious. The disease can also be transmitted by the injection of blood taken from a yellow fever patient.

Classification and Symptomatology.—Like most other acute infectious diseases, yellow fever occurs in different grades of severity. It is sufficient to mention the following forms: viz., mild, moderate, grave, and fulminating. Conditions of the individual likely to aggravate the attack are those having a similar effect in other fevers: viz., loss of sleep, severe and prolonged physical exertion, excessive sexual indulgence, mental depression—as from fear, anxiety, melancholy, excesses in eating and drinking, and complications from preexisting or intercurrent diseases. Conditions favoring severity of epidemics are not fully understood, but unhygienic influences—as overcrowding, filth from decomposing vegetable and animal products, imperfect drainage and sewerage, inadequate ventilation, lack of sunlight, excessive heat and humidity—undoubtedly play an important rôle. An epidemic moderate in the beginning may increase in virulence as it progresses.

The period of incubation is usually short: most frequently from 1 to 5 days, and rarely exceeding a week.

The onset is commonly sudden, the patient generally being able to state definitely the hour of the attack. Less frequently, the invasion is preceded by anorexia, malaise, headache, and mental and muscular debility. A well-pronounced rigor is mentioned as an initial symptom by many authors, but most patients will mention only a sense of chilliness and discomfort.

The fever rises rapidly, and often reaches its acme within a few hours from the onset. There are cutting pains through the forehead; the eyes ache; the muscles of the back, loins, thighs and calves are sore, and often ache severely even in mild cases. These symptoms continue during the febrile stage. It should be noted that the pains, except those in the head, involve the muscles rather than the joints. The face is turgid, not infrequently a dusky red; the upper lip is often swollen. The appearance resembles that of the early stages of typhus or the stage of measles before the eruption, with an addition of slight or well-marked jaundice. The conjunctivæ are congested and shiny, with a yellow tinge; the eyes are sometimes intensely red and sensitive to light. The jaundice becomes more distinct after the first or second day, the skin showing the same combination of capillary stasis with an icteroid hue as the eyes. Yellowness may be demonstrated by pressure or pinching when otherwise it would be unnoticed. As the case progresses jaundice may be intense and unmistakable.

The surface of the body may be hot and dry, but more frequently there is a tendency to diaphoresis, which is especially marked at the end of the febrile stage. In some fatal cases the skin remains dry until death; in others, with the stage of depression there is a cold, clammy sweat. Great significance has been attached to a peculiar musty odor given off from the body; this symptom is undoubtedly present in some instances, but more frequently it is absent. The mental condition is one of alertness and anxiety.

Gastrointestinal Symptoms.—The appetite is lost from the beginning, but returns at the expiration of the fever. The patient is likely to be thirsty throughout the attack. The tongue is whitish in the center, with red tip and edges, and is pointed. The gums are swollen and are disposed to bleed easily. There is marked tenderness and pain in the region of the stomach; nausea and vomiting are very common, the vomitus in the first stage being chiefly the ingested fluids with mucus. In the stage of depression the tendency to passive hemorrhages is manifested by vomiting of blood more or less discolored and disintegrated by the gastric secretions; this is the black or coffee-ground vomit to which such grave significance is attached. It is often ejected with great force and in large quantity; at other times it may be small in amount and mixed with mucus, or there may be an active hemorrhage and vomiting of pure blood. The bowels are nearly always constipated; hemorrhage from the intestines is not infrequent, and is also likely to occur from the nose, gums, kidneys, and uterus.

The urine is scanty; there is a decided diminution in the excretion of solids, and albumin is found so constantly as to be generally regarded as one of the pathognomonic symptoms. It usually appears within 72 hours; there may be only a trace found by careful testing of the evening urine. In the second stage, or stage of depression, the amount of albumin may be large, granular and other casts are found, and there is a decided tendency to suppression, with the consequent uremia. The early occurrence of an acute parenchymatous nephritis in a large proportion of cases is of the utmost importance, both from a diagnostic and a prognostic standpoint. This aspect of the subject will receive further notice under the heading of differential diagnosis.

Course of the Fever.—As previously observed, yellow fever is a disease of one short paroxysm, lasting usually from 2 to 5 days, but sometimes continuing longer and assuming an irregular or typhoid aspect. The temperature curve is characterized by a sudden sharp ascent, reaching the highest point most frequently on the first day; from this time the line ordinarily descends rapidly until the normal point is reached, which is the termination of the first stage. In mild cases the patient may rapidly become convalescent; in moderate or severe cases the second stage, or stage of depression, supervenes, when the temperature may be normal, slightly above normal, subnormal, or elevated, and the fever may run an irregular course. It is in this stage that the serious effects of the toxins upon the blood and upon the various organs are manifested by passive hemorrhages and uremia. Sternberg states that, out of 192 cases recorded by Faget, Jones, and himself, the highest temperature was reached on the first day in 102, on the second in 54, and on the third in 33. The initial temperature ranges from 101.6° to 104.5° F. The height of the fever is an index to the gravity of the case. Out of 10 cases approximating a temperature of 105° F., only 1 recovered. The typical febrile course is likely to be disturbed by complications of various kinds.

The Pulse-rate.—The pulse of yellow fever is characterized by its abnormal slowness and by its want of correlation with the temperature. This latter phenomenon—known as Faget's law—possesses great diagnostic significance. It is exhibited best during the first 3 days. In other fevers the rule is that the rapidity of the pulse-rate increases with the temperature, while in yellow fever, though the thermometer may show a rise of from 1 to 4 degrees, the pulse continues to fall.

Diagnosis.—In order to aid physicians in the prompt recognition of yellow fever, and to assist in its prevention as far as possible, the following excellent presentation of the subject, made by Dr. Samuel L. Bemis, and adopted by the State Board of Health of Louisiana, is quoted.

The following group of symptoms is considered to be indicative of yellow fever:

Group First.—A person after (1) a sudden attack has (2) a fever of one paroxysm, attended with (3) marked congestion or blood stasis of capillaries of the surface, conjunctivæ, and gums, with (4) a history of probable exposure to infection and (5) no history of a previous attack of yellow fever.

Group Second.—A person after (1) a sudden attack has (2) fever of one paroxysm, followed by (3) unusual prostration, (4) albuminous urine, and (5) yellowness of the conjunctivæ or skin, and having (6) no positively authenticated history of a previous attack of yellow fever.

Group Third.—A person has (1) a fever of one paroxysm, (2) albuminous urine, (3) black vomit, (4) suppression of urine, or (5) general hemorrhagic tendency under (6) circumstances when exposure to infection is a possibility.

The following symptoms are held to be suspicious of yellow fever when associated with a fever of one paroxysm in a person who has never had the disease:

1. Suddenness of attack, either with violent pains in the back and head and injected eyes and face, or with marked congestion of the superficial capillaries.
2. Want of that correlation between pulse and temperature usual to other forms of fever.
3. Albuminous urine.
4. Black vomit.
5. General hemorrhagic tendency.
6. Yellowness of skin.
7. Any case respecting which reputable and experienced physicians disagree as to whether the disease is or is not yellow fever.
8. Any case respecting which efforts are made to conceal its existence, full history, and true nature, in violation of ordinances requiring a report of the same.

Differential Diagnosis.—The disease with which yellow fever is most likely to be confounded is dengue, not only from the remarkable resemblance of these fevers, but on account of a similar geographic distribution and because of their frequent concurrent prevalence. "In time of appearance, and generally in geographic distribution, they seem related to each other. Dengue has, however, prevailed in Asia and Egypt, where yellow fever is unknown. Both diseases are arrested by severe frosts. Both dengue and yellow fever are diseases characterized by one febrile paroxysm" (Foster).

In view of the possibility of dengue and yellow fever coexisting, the following table (from Jackson) is appended:

	Yellow Fever.	Dengue.	Malarial Fevers.
Temperature	Fever of one paroxysm, as a rule. High temperature for 3 days.	Fever of two paroxysms and a remission, as a rule. Fever high in first period; low in second.	Fever of several paroxysms with remissions or intermissions. Moderate temperature, as a rule.
Duration of fever	3 to 7 days	5 to 8 days	Variable duration. May last weeks.
Incubation	Human incubation, 1 to 6 days. Mosquito incubation about 12 days.	Short incubation, 1 to 5 days: average less than 3 days.	Human incubation, 1 to several days. Mosquito incubation, about 10 days.
Vomiting	Very common symptom—both bilious and hemorrhagic (black vomit).	Not common. Bilious vomiting in some cases.	May or may not be present. Bilious in character.
Pulse	At first, rapid and bounding; later, abnormally slow and soft. Does not correspond with temperature.	Corresponds with febrile temperature.	Corresponds with febrile temperature.
Jaundice	Characteristic and constant	Rare	Subicteric jaundice rather common.
Eruptions	Rare and not characteristic	Common and distinctive	Rare and not characteristic.
Urine	Scanty; often completely suppressed, and albuminous from early stages.	Quantity ample. Rarely albuminous.	Not usually albuminous nor suppressed.
Mentality	Apathy common. Consciousness preserved as a rule.	Preserved	Delirium not uncommon.
Hemorrhagic symptoms.	Frequent and often fatal. (Gastric and intestinal chiefly.)	Of rare occurrence and of slight consequence.	Rare except in pernicious cases and in malarial hemoglobinuria.
Fatality	Average mortality 25 per cent	Non-fatal	Rarely fatal if treated properly.
Convalescence	Rapid and without sequels	Rather prompt but with arthralgic and myalgic sequels.	Slow, succeeded by anemia; and is apt to recur.
Immunity	One attack confers subsequent immunity.	Doubtful immunity	No immunity.
Response to treatment.	Abortive or curative treatment negative.	Symptomatic treatment alleviates.	Satisfactory, specific (quinine) treatment cures.
Blood condition	Incomplete coagulation and free hemoglobin in serum. Red cells not greatly altered. White corpuscles either increased or decreased.	Leukocytosis common. Decreased leukocytes claimed by some observers.	Malaria parasites and pigment present. Leukopenia with a relative increase of large mononuclear leukocytes, the rule.

The symptoms that have heretofore been relied upon to differentiate yellow fever and dengue are the occurrence in the former of albuminuria, the characteristic facies (inclusive of jaundice), the divergent pulse and temperature, and excessive irritability of the stomach and passive hemorrhages. The absence of such symptoms in the main, the presence of an eruption, and a want of mortality in connection with the ordinary febrile phenomena are considered as characteristic of dengue. The diagnostic significance of the foregoing symptoms requires modification: that is to say, a careful examination of the urine in cases of undoubted dengue may demonstrate a mild and evanescent albuminuria. A certain proportion of these cases may have slight jaundice, severe nausea, vomiting, and a disposition to passive hemorrhages from mucous membranes.

Aside from the increased mortality of yellow fever and the characteristic postmortem findings, the differential diagnosis between these two diseases can be made by the symptom-complex of an acute nephritis in yellow fever and its absence in dengue. In the latter disease simple parenchymatous changes may occur in the kidneys, manifested by a slight and temporary albuminuria; while in the former, in a series of cases many will afford incontestable evidence of a severe nephritis: viz., scanty urine, of high color and high specific gravity, intense and persistent albuminuria, hematuria, casts, a decided tendency to suppression, and the accompanying uremia. There is no authority who will claim that a serious kidney involvement belongs to the pathology of dengue; on the contrary, it is universally conceded that the nephritic complications dominate the clinical picture in every severe case of yellow fever.

Prognosis.—Reference has been made to the fact that yellow fever is a protean disease, with a mortality varying in the extreme degrees from 85 percent, as in the epidemic of 1853, to 4 percent, as in that of 1897. Further illustrating this fact is the experience of Touatre, who states that in the epidemic of 1867 in New Orleans he lost an average of 1 patient in 3; in 1870, 1 in 14; in 1873, 1 in 13; in 1878, 1 adult in 29, 1 child in 52; in 1897 he treated 76 patients—33 adults and 43 children—without a death.

The death-rate will be affected: (1) By the comparative virulence or attenuation of the microorganism that produces the disease; (2) by idiosyncrasies, age, race, and acclimatization of the patients; (3) by intercurrent complications. The patient may be overwhelmed by the intensity of the toxins—suddenly struck down, with vertigo, stupor, coma, or convulsions; with weak, fluttering pulse; cold, clammy skin; involuntary discharges; and profuse hemorrhages, speedily terminating in death. In these fulminating cases the temperature is likely to be subnormal and the yellow discoloration of the skin is absent.

In individual cases three important prognostic indications are afforded: (1) by the height and range of the temperature; (2) the severity of the kidney complications; (3) the disposition to hemorrhage.

Touatre makes the following observations: "When the fever reaches its maximum at the outset, and defervescence is continuously noted at each visit, the disease is mild. When the fever ranges between 103° and 104.5° F., even during the first 3 days, with remissions of at least a degree in the morning, and the exacerbations are less and less pronounced each night, the patient always recovers. When the fever ranges between 104° and 105° F., still with remissions of at least 1 degree, but with exacerbations above the previous day, the disease is grave, but recoveries are more numerous than fatal results. When the fever reaches 105° F. or above within the first 12 hours, the attack is nearly always fatal, unless by heroic treatment the temperature can be reduced at least 2 degrees. When defervescence is not maintained after the temperature has reached 105° F. or above, and the fever rises to the same point again, death is almost certain. A temperature above 105° F. during the first 24 hours in adults gives slight hopes of recovery.

The extent of kidney involvement, and of consequent functional incapacity, is an important prognostic guide. The severe symptoms of the stage of depression, the vital prostration and the nausea, vomiting, headache, stupor, coma, and convulsions are chiefly of uremic origin.

If the urine is abundant in spite of a decided albuminuria, the chances for recovery are good. Scanty urine, with much albumin on the second day, indicates danger. Recovery rarely, if ever, ensues after complete suppression has lasted as long as 12 hours. The disposition to passive hemorrhages, as manifested by black vomit, and by bleeding from the gums, intestines, uterus, nose, and other mucous surfaces, is of serious import, but is not necessarily attended by a fatal result.

Prophylactic Treatment.—Yellow fever patients should be isolated and screened against the mosquito. Nonimmunes should be guarded against infection by the mosquito by screening houses, etc. Prophylaxis consists essentially in the destruction of the mosquito. The stegomyia fasciata is a house mosquito, biting mostly by day, disliking both sunlight and darkness. It is often carried long distances by railway or ship. The mosquitos should be destroyed by drainage and insecticides. Breeding places should be covered with petroleum, etc. Disinfection of their lurking places is best accomplished in the house or aboard ship by means of fumigation with sulphur or formaldehyd. See DISINFECTION.

Medicinal Treatment.—The important fact to be remembered in the treatment of yellow fever is that it is a self-limited disease of short duration, and one likely to be complicated by serious lesions of vital organs. There is no specific. Treatment should begin promptly, and while it should be energetic and careful, all doubtful, useless, and harmful medication should be avoided.

1. The first indication is absolute **rest** in the recumbent posture from the onset until convalescence is well advanced. There is no disease in which this rule is more imperative, or in which its disregard is so fraught with serious consequences. The action of the toxins upon the heart, kidneys, stomach, intestines, liver, brain, and muscular structures is aggravated by physical exertion. Hence the patient should be put to bed at once, should not be allowed any imprudent movements in bed, and should be rigidly kept there until well on the road to recovery.

2. The second indication is **ventilation, cleanliness, and disinfection** of the sick-room and of all its appurtenances. The popular idea that fresh air should be excluded by closure of windows and doors must be combated by the physician. In the intensification of the infection by overcrowding and inadequate ventilation, yellow fever resembles typhus. While drafts should be avoided and chills from uncovering should be prevented, there should be an abundant admission of fresh air, and, if possible, of sunlight. Scrupulous cleanliness of bedding and clothing and of the body of the patient should be maintained. All excretions should be disinfected and speedily removed.

3. The third indication is **prompt evacuation of the gastrointestinal canal.** If the stomach should contain food at the onset, a mild emetic, such as a dose of ipecac or a glass of warm water with mustard and common salt, should be given. The bowels should be emptied quickly. Castor oil, on account of the rapidity, mildness, and certainty of its action, is used by many; but its nauseous odor and taste are objectionable to most persons, hence the effervescent salines are to be preferred.

Calomel is excellent, not only for its purgative, but also for its antiseptic effect: from 3 to 4 grains in divided doses for adults, and proportionately smaller doses for children, is usually sufficient; it should be given during the first 24 hours. Afterward, 1 or 2 daily movements should be obtained by enemata of warm solutions of common salt, sulphate of magnesium, or sodium, to which glycerin, for its osmotic effect, is a useful addition. Purgatives are useful, not only to empty the intestines of irritant and undigested contents, but to prevent autoinfection, to relieve congested blood-vessels, to allay nausea, and to act vicariously on the kidneys.

4. The hot mustard foot-bath, for its diaphoretic and revulsive effect. It should be given under blankets, and as hot as the patient can bear, hot water being added from time to time. Properly given, the foot-bath produces free action upon the skin, attracts the blood from the upper to the lower parts of the body, relieves internal congestion, and allays pain.

5. **Attention to Diet.**—Contrary to the rule in treating other fevers, in yellow fever the patient should be starved. During the first 3 or 4 days, and longer in severe cases, no food whatever should be allowed, and then only the blandest and most digestible liquids, in small portions, as milk with lime-water, Vichy, or barley-water; buttermilk; wine whey; or corn, oatmeal, or barley gruel. Meat, eggs, beef-tea, or nitrogenous foods of any kind should not be given until the urine is abundant and free from albumin. Only those who have treated yellow fever can appreciate the necessity for such rigid rules of diet. It should be remembered that digestion is in abeyance, that the gastrointestinal mucous membrane is intensely congested, that nausea and vomiting are present, that hemorrhage is likely to ensue, that nature warns us to give the stomach rest, and that food now is poison. Probably more patients have been killed by indiscreet eating during convalescence than by almost any other cause. The physician should proceed carefully, gradually increasing the amount and changing the character of the food as the symptoms indicate restoration of the functions of the secretory and excretory organs.

6. **Diluents, Diaphoretics, and Diuretics.**—Alkaline carbonated waters, as Vichy or Apollinaris, should be freely used, and are beneficial in various ways: they allay nausea, correct excessive acidity, cleanse the stomach, and promote action of skin and kidneys. Ice may be added or not according to taste; the quantity taken may be regulated by the tolerance of the stomach. Warm drinks, as orange-leaf and watermelon-seed tea, serve a useful purpose in the same way, and are extensively used as domestic remedies. While it is important to promote activity of the skin, sweltering the patient beneath heavy blankets and exhausting him by excessive sweating should be prohibited. Pilocarpin, on account of its depressing effect, should be very carefully prescribed, if at all. Stimulating diuretics should not be given; it is better to flush the kidneys by the free use of diluents than to run the risk of increasing congestion by the effects of turpentine and the like.

7. **Regulation of the Temperature.**—Hyperpyrexia is best controlled by cold spongings and baths. Ordinarily, repeated spongings, as required, with water or with a mixture of water, vinegar, and alcohol, at a temperature varying according to the height and obstinacy of the fever, are preferable to the cold bath; lifting the patient in and out of the tub, with its attendant perturbations, is objectionable. Touatre, however, is an earnest advocate of the cold bath in cases where the temperature reaches 104°-105° F. He uses the bath boldly, and claims that the mortality in such cases can be reduced in this way only. Opinion is divided as to the use of the coal-tar antipyretics; if used at all, they should be prescribed only during the first 24 hours, and then in moderate doses. The effects produced by these remedies are undoubtedly pleasant in relief of the symptoms; but in a disease where cardiac depression is so marked a feature, care should be taken not to injure the patient for the sake of mere temporary relief.

8. **Treatment of Complications.** *Nausea, Vomiting, Black Vomit.*—Direct medication to meet these symptoms is not usually required. In addition to the general measures already recommended, such as rest, abstention from food, iced carbonated drinks, purgatives, and enemata, the following simple procedures are advisable: sinapisms to the epigastrium; ice-cold cloths to head, face, and neck; cocain tablets in 1/4-grain doses; a combination of creosote and subnitrate of bismuth. Rectal injections of chloral hydrate—from 15 to 20 grains for adults, and proportionately smaller doses for children—will not only often arrest the vomiting, but will allay nervous excitement and produce sleep. It should be remembered that the severe gastric symptoms are often of uremic origin, and that black vomit is due to profound blood and tissue changes, hence rational treatment should be directed to the underlying cause rather than to the symptom.

Uremia, Albuminuria, Scanty and Suppressed Urine.—In addition to the general measures indicated which are, largely beneficial, in actual or threatened kidney trouble we must consider additional resources needful in the presence of these grave complications: viz., intravenous, intracellular injections, or high rectal enemata of normal solution of chlorid of sodium in sterilized water and wet and dry cups over the region of the kidneys. These means will sometimes succeed when others have failed in impending anuria.

Restlessness and insomnia are best relieved by hydrated chloral administered by the rectum according to the necessities of the case.

Malaria.—When the case is thus complicated, quinin should be given. The routine treatment by this agent should be condemned.

Tendency to heart failure is to be treated by the moderate use of iced champagne or whisky, and by hypodermic injections of digitalis, strychnin, or caffein.

A nurse who will carry out the physician's instructions to the letter is indispensable. Many patients with yellow fever are frightened to death. The conduct of attendants should be such as to quiet fear and excitement, instead of contributing to them. It is only by careful attention to details that success may be attained in severe cases. If possible, there should be an attendant who has had previous experience with the disease.

Sternberg's treatment, by means of which a death rate of only 7.3 percent was secured, consists in giving 7 1/2 grains of sodium bicarbonate and 1/60 grain of bichlorid of mercury every hour with a liberal amount of water. In addition, a hot mustard foot-bath is advised during the first day, no food being given for 3 days, and then stimulants and a milk diet are ordered. Cold sponging and cold applications to the head and sinapisms over the stomach and lumbar regions are recommended.

Serum treatment has not yet proved satisfactory.

YEO'S METHOD.—A method of treating obesity, consisting of a dietary that limits the amount of farinaceous food, prohibits sugar, limits the amount of liquids taken with the meals, but encourages the drinking of large amounts of hot or warm aromatic beverages between meals.

YERBA SANTA.—See Eriodictyon.

Z

ZEA (**Corn Silk; Maize; Indian Corn**).—The fresh styles and stigmas of *Zea Mays*, the maize or Indian corn. It contains *maizenic acid*, a fixed oil, resins and salts. Dose, of a fluidextract, 1 to 2 drams; of an infusion (1 to 8), 4 to 8 ounces, almost *ad libitum*. There are no official preparations.

Zea is a certain but mild diuretic when given in full doses at short intervals. It has been used with success for incontinence of urine, uric and phosphatic gravel, gout, rheumatism, urethritis, pyelitis, acute and chronic cystitis, cardiac dropsy and obstructive valvular disease of the heart.

ZINC (**Zincum**). Zn = 64.9; quantivalence II.—A metallic element, with a lead-like luster. It is represented in medicine by several of its salts, all of which are more or less poisonous. In small doses it is tonic and astringent; in larger quantities, a strong emetic. It is used mainly in the form of lotions in conjunctivitis, in various catarrhs, and in certain skin-diseases.

Preparations.—**Z. Acetas,** soluble in 3 of water and in 36 of alcohol at 59° F., in 1/2 of boiling water and in 3 of boiling alcohol. Used locally as an astringent in solution of 1 or 2 grains to the ounce, or internally in doses of 1/2 to 3 grains. **Z. Carbonas Præcipitatus,** insoluble in water or alcohol, but soluble in acids with copious effervescence. Used locally as a protective. **Z. Chloridum,** very soluble in water and in alcohol; very deliquescent. Is tonic and escharotic. For internal use a solution in spirit of ether is the most convenient form, strength 1 dram to the ounce, of which 4 to 8 minims may be given twice daily in water. Strength of injections and collyria, 1 to 2 grains to the ounce. **Liquor Z. Chloridi** is an aqueous solution, containing about 50 percent of the salt. A clear, colorless, odorless liquid, of a very astringent, sweetish taste and an acid reaction. A powerful disinfectant for sinks, drains, etc. Used also as an injection in gonorrhea, leukorrhea, etc., in dilute solution, 1/2 to 1 percent. *Burnett's Disinfecting Fluid* is similar to the above, but slightly stronger. **Z. Iodidum,** very soluble in water and in alcohol. Dose, 1/2 to 2 grains in syrup. **Z. Oxidum,** insoluble in water or alcohol; soluble without effervescence in dilute acids; also in ammonia water. Dose, 1 to 10 grains in pill. **Unguentum Z. Oxidi** has of zinc oxid 20, benzoinated lard 80. **Z. Phenolsulphonas** (*Zinc Sulphocarbolate*), very soluble in water and in alcohol. Dose, 1 to 5 grains. **Z. Stearas.** Used locally as a dressing powder and a vehicle for dry antiseptics. **Unguentum Z. Stearatis,** strength 50 percent, made with white petrolatum. **Z. Sulphas,** soluble in 0.6 of water, insoluble in alcohol. Dose, as emetic, 10 to 20 grains; as a tonic and astringent, 1/10 to 2 grains in pill. **Z. Valeras,** soluble in about 50 of water and in about 35 of alcohol. Dose, 1/4 to 4 grains in pill.

ZINGIBER.—See Ginger.

ZOSTER.—See Herpes Zoster.